C103.2 Information on construction documents. Construction documents shall be drawn to scale upon suitable material. Electronic media documents are permitted to be submitted when *approved* by the *code official*. Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed, and show in sufficient detail pertinent data and features of the building, systems and equipment as herein governed. Details shall include, but are not limited to, as applicable:

1. Energy compliance path per Section C401 or C501.
2. Insulation materials and their *R*-values.
((~~2.~~)) 3. Fenestration *U*-factors and SHGCs.
((~~3.~~)) 4. Area-weighted *U*-factor and SHGC calculations.
((~~4.~~)) 5. Mechanical system design criteria.
((~~5.~~)) 6. Mechanical and service water heating system and equipment types, sizes and efficiencies.
((~~6.~~)) 7. Economizer description.
((~~7.~~)) 8. Equipment and systems controls.
((~~8.~~)) 9. Fan motor horsepower (hp) and controls.
((~~9.~~)) 10. Duct sealing, duct and pipe insulation and location.
((~~10.~~)) 11. Lighting fixture schedule with wattage and control narrative.
((~~11.~~)) 12. Location of daylight zones on floor plan.
((~~12.~~)) 13. Air barrier details including all air barrier boundaries and associated square foot calculations on all six sides of the air barrier as applicable.

Commented [EVM1]: Recommend adding editorial clarification to include reference to C501 for existing buildings.
Permit documents need to outline the energy compliance path for existing buildings also.

C402.2.86 Insulation of radiant heating systems. *Radiant heating system* panels, and their associated components that are installed in interior or exterior assemblies shall be insulated to an *R*-value of not less than R-3.5 on all surfaces not facing the space being heated. *Radiant heating system* panels that are installed in the *building thermal envelope* shall be separated from the exterior of the building or unconditioned or exempt spaces by not less than the *R*-value of insulation installed in the opaque assembly in which they are installed or the assembly shall comply with Section C402.1.4.

EXCEPTION: Heated slabs on grade insulated in accordance with Section C402.2.4.

Commented [AB2]: Editorial edit to correct naming

AMENDATORY SECTION (Amending WSR 19-24-040, filed 11/26/19, effective 7/1/20)

WAC 51-11C-402.2.7 Airspaces. Where the ((~~thermal properties~~)) R-value of an airspace((~~s are~~)) is used ((~~to comply with this code~~)) for compliance in accordance with Section C401.2, ((~~such~~)) the airspace((~~s~~)) shall be enclosed in an unventilated cavity constructed to minimize airflow into and out of the enclosed airspace. Airflow shall be deemed minimized where the enclosed airspace is located on the interior side of the continuous air barrier and is bounded on all sides by building components.

EXCEPTION: The thermal resistance of airspaces located on the exterior side of the continuous air barrier and adjacent to and behind the exterior wall covering material shall be determined in accordance with ASTM C1363 modified with an airflow entering the bottom and exiting the top of the airspace at a minimum air movement rate of not less than 70 mm/sec.

Commented [AB3]: Editorial comment to correct section naming

AMENDATORY SECTION (Amending WSR 19-24-040, filed 11/26/19, effective 7/1/20)

C402.5.11 Operable openings interlocking. Where any operable openings to the outdoors are larger than 48 square feet (4.47 m^2) in area, such openings shall be interlocked with the heating and cooling system as required by Section C403.4.1.6.

EXCEPTIONS:
1. Separately zoned areas associated with the preparation of food that contain appliances that contribute to the HVAC loads of a restaurant or similar type of occupancy.
2. Warehouses that utilize overhead doors for the function of the occupancy, where *approved* by the *code official*.
3. The ~~first~~ outer entrance doors where located in the exterior wall and are part of a vestibule system.

Commented [EVM4]: Recommend editorial correction to replace the word "first" with "outer" to clarify intent of code.

C403.3.2.3 Chillers. Chilled water plants and buildings with more than 500 tons total capacity shall not have more than 100 tons provided by air-cooled chillers.

EXCEPTIONS:
1. Where the designer demonstrates that the water quality at the building site fails to meet manufacturer's specifications for the use of water-cooled equipment.
2. Air-cooled chillers with minimum efficiencies at least 10 percent higher than those listed in Table ((~~C403.3.2(7)~~)) C403.3.2(3).
3. Replacement of existing air-cooled chiller equipment.
4. Air-to-water heat pump units that are configured to provide both heating and cooling and that are rated in accordance with AHRI 550/590. Where the air-to-water heat pumps are designed for a maximum supply leaving water temperature of less than 140°F, the efficiency rating will be calculated and reported at the maximum unit leaving water temperature for this test condition.

Commented [AB5]: Editorial comment: New AWHP efficiency table clarifies this. Was struck in 2018 SEC.

Table C403.3.2(15)
Heat-Pump and Heat Recovery Chiller Packages—Minimum Efficiency Requirements[g,h,i,j,k]

Commented [EVM6]: Add additional clarifying footnotes for this new 90.1 efficiency table.

HEATING OPERATION														
Equipment Type	Size Category, ton[a]	Cooling-Only Operation Cooling Efficiency at Standard Rating Conditions (FL/IPLV), Btu/Wh Water-Source Power Input per Capacity (FL/IPLV), kW/ton[a]		Heating Source Conditions (entering/leaving water) or OAT (db/wb), °F	Heat-Pump Heating Full-Load Efficiency (COP_H)[b], W/W				Heat Recovery Chiller Full-Load Efficiency (Cooling, W/W Simultaneous Cooling and Heating Full-Load Efficiency ($COP_{H\&C}$)[c], W/W					Test Procedure[d]
					Leaving Heating Water Temperature				Leaving Heating Water Temperature					
		Path A	Path B		Low	Medium	High	Boost	Low	Medium	High	Boost		
					105°F	120°F	140°F	140°F	105°F	120°F	140°F	140°F		
Air source	All sizes	≥9.595 FL ≥13.02 IPLV.IP	≥9.215 FL ≥15.01 IPLV.IP	47 db 43 wb[b]	≥3.290	≥2.770	≥2.310	NA	NA	NA	NA	NA	NA	AHRI 550/590
		≥9.595 FL ≥13.30 IPLV.IP	≥9.215 FL ≥15.30 IPLV.IP	17 db 15 wb[b]	≥2.230	≥1.950	≥1.630	NA	NA	NA	NA	NA	NA	
Water-source electrically operated positive displacement	< 75	≥0.7885 FL ≥0.6316 IPLV.IP	≥0.7875 FL ≥0.5145 IPLV.IP	54/44[f]	≥4.640	≥3.680	≥2.680	NA	≥8.330	≥6.410	≥4.420	NA		
				75/65[f]	NA	NA	NA	≥3.550	NA	NA	NA	≥6.150		
	≥ 75 and < 150	≥0.7579 FL ≥0.5895 IPLV.IP	≥0.7140 FL ≥0.4620 IPLV.IP	54/44[f]	≥4.640	≥3.680	≥2.680	NA	≥8.330	≥6.410	≥4.420	NA		
				75/65[f]	NA	NA	NA	≥3.550	NA	NA	NA	≥6.150		
	≥ 150 and < 300	≥0.6947 FL ≥0.5684 IPLV.IP	≥0.7140 FL ≥0.4620 IPLV.IP	54/44[f]	≥4.640	≥3.680	≥2.680	NA	≥8.330	≥6.410	≥4.420	NA		
				75/65[f]	NA	NA	NA	≥3.550	NA	NA	NA	≥6.150		
	≥ 300 and < 600	≥0.6421 FL ≥0.5474 IPLV.IP	≥0.6563 FL ≥0.4305 IPLV.IP	54/44[f]	≥4.930	≥3.960	≥2.970	NA	≥8.900	≥6.980	≥5.000	NA		
				75/65[f]	NA	NA	NA	≥3.990	NA	NA	NA	≥6.850		
	≥ 600	≥0.5895 FL ≥0.5263 IPLV.IP	≥0.6143 FL ≥0.3990 IPLV.IP	54/44[f]	≥4.930	≥3.960	≥2.970	NA	≥8.900	≥6.980	≥5.000	NA		
				75/65[f]	NA	NA	NA	≥3.990	NA	NA	NA	≥6.850		
Water-source electrically operated centrifugal	< 75	≥0.6421 FL ≥0.5789 IPLV.IP	≥0.7316 FL ≥0.4632 IPLV.IP	54/44[f]	≥4.640	≥3.680	≥2.680	NA	≥8.330	≥6.410	≥4.420	NA		
				75/65[f]	NA	NA	NA	≥3.550	NA	NA	NA	≥6.150		
	≥ 75 and < 150	≥0.5895 FL ≥0.5474 IPLV.IP	≥0.6684 FL ≥0.4211 IPLV.IP	54/44[f]	≥4.640	≥3.680	≥2.680	NA	≥8.330	≥6.410	≥4.420	NA		
				75/65[f]	NA	NA	NA	≥3.550	NA	NA	NA	≥6.150		
	≥ 150 and < 300	≥0.5895 FL ≥0.5263 IPLV.IP	≥0.6263 FL ≥0.4105 IPLV.IP	54/44[f]	≥4.640	≥3.680	≥2.680	NA	≥8.330	≥6.410	≥4.420	NA		
				75/65[f]	NA	NA	NA	≥3.550	NA	NA	NA	≥6.150		
	≥ 300 and < 600	≥0.5895 FL ≥0.5263 IPLV.IP	≥0.6158 FL ≥0.4000 IPLV.IP	54/44[f]	≥4.640	≥3.680	≥2.680	NA	≥8.900	≥6.980	≥5.000	NA		
				75/65[f]	NA	NA	NA	≥3.990	NA	NA	NA	≥6.850		
	≥ 600	≥0.5895 FL ≥0.5263 IPLV.IP	≥0.6158 FL ≥0.4000 IPLV.IP	54/44[f]	≥4.640	≥3.680	≥2.680	NA	≥8.900	≥6.980	≥5.000	NA		
				75/65[f]	NA	NA	NA	≥3.990	NA	NA	NA	≥6.850		

For SI: °C = [(°F) - 32]/1.8.

a Chapter 6 contains a complete specification of the referenced standards, which include test procedures, including the reference year version of the test procedure.
b Cooling-only rating conditions are standard rating conditions defined in AHRI 550/590, Table 1.
c Heating full-load rating conditions are at rating conditions defined in AHRI 550/590, Table 1.
d For water-cooled heat recovery chillers that have capabilities for heat rejection to a heat recovery condenser and a tower condenser, the COPHR applies to operation at full load with 100 percent heat recovery (no tower rejection). Units that only have capabilities for partial heat recovery shall meet the requirements of Table C403.3.2(3).
e Outdoor air entering dry-bulb (db) temperature and wet-bulb (wb) temperature.
f Source-water entering and leaving water temperature.
g This table is a replica of ASHRAE 90.1 Table 6.8.1-16 Heat-Pump and Heat Recovery Chiller Packages—Minimum Efficiency Requirements.
h. AHRI ratings are not required for equipment sizes larger than those covered by the test standard.
i. Air-to-water heat pumps that are configured to operate only in heating and not in cooling only need to comply with the minimum heating efficiencies.
j. Units that are both an air-to-water heat pump and a heat recovery chiller are required to comply with either the applicable air source efficiency requirements or the heat recovery chiller requirements but not both.
k. Heat pumps and heat recovery chillers are only required to comply with one of the four leaving heating water temperature criteria. The leaving heater water temperature criteria that is closest to the design leaving water temperature shall be utilized.

Commented [EVM7]: Recommend adding these editorial clarifying notes to this new ASHRAE 90.1 table to clarify intent of code for new standards for air-to-water heat pumps and heat recovery chillers.

C403.3.5.1 DOAS with energy recovery ventilation ((~~with DOAS~~)). The DOAS shall include energy recovery ((~~*ventilation*~~)). The *energy recovery ventilation* system shall have a ((~~60~~)) 68 percent minimum sensible recovery effectiveness of the energy recovery device as calculated in accordance with Equation 4-9 or provide an enthalpy recovery ratio of not leass than ~~have ((50))~~ 60 percent at design conditions ~~enthalpy recov- ery effectiveness~~ in accordance with Section C403.7.6. ((~~For DOAS hav- ing a total fan system motor nameplate hp less than 5 hp, total com- bined fan power shall not exceed 1 W/cfm of outdoor air. For DOAS hav- ing a total fan system motor hp greater than or equal to 5 hp, refer to fan power limitations of Section C403.8.1. This fan power restric- tion applies to each dedicated outdoor air unit in the permitted project, but does not include the fan power associated with the zonal heating/cooling equipment. The airflow rate thresholds for energy re- covery requirements in Tables C403.7.6(1) and C403.7.6(2) do not ap- ply.~~)) The airflow rate thresholds in Section C403.7.6 that define when the energy recovery requirements in that section do not apply, are not applicable to this section. The return/exhaust air stream tem- perature for heat recovery device selection shall be 70°F (21°C) at 30 percent relative humidity, or as calculated by the registered design professional.

Commented [EVM8]: Recommend editorial correction to use same code language as C403.7.6.2

Commented [EVM9]: Recommend clarifying adding editorial clarification to Exception 3 below to have same language as C403.3.5.1 located here.

(Equation 4-9)

$$\text{Sensible Recovery Effectiveness} = \frac{T_{OA} - T_{SA}}{T_{OA} - T_{RA}}$$

Where:

T_{OA} = Design outdoor air dry bulb temperature entering the energy recovery device.

T_{SA} = Supply air dry bulb temperature leaving the energy recovery device at design temperatures and airflow conditions, as selected for the proposed DOAS unit(s).

T_{RA} = Design return air dry bulb temperature.

EXCEPTIONS: 1. ((~~Occupied spaces with all of th ; following characteristics: Complyir g with Section C403.7.6, served by equipment less than 5000~~ cfm, with an average occupant load greater than 25 people per 1000 sq uare feet (93 m^2) of floor area (as established in Table 403.3.1.1 ~~of the *International Mechanical Code*) that include demand control ventilation configured to reduce outdoor air by at least 50 percent below design minimum ventilation rates when the actual occupancy of the space served by the system is less than the design occupancy. 2.~~)) Systems installed for the sole purpose of providing makeup air for systems exhausting toxic, flammable, paint, or corrosive fumes or dust, dryer exhaust, or commercial kitchen hoods used for collecting and removing grease vapors and smoke.
2. Heat recovery and energy recovery ventilators (H/ERV) that are rated and *listed* in accordance with HVI 920 can demonstrate compliance with the sensible recovery effectiveness requirement using the adjusted sensible recovery effectiveness (ASRE) rating of the equipment at 32°F test conditions. Applied flow rate for ASRE rating shall be no less than the design flow rate or the closest value

C403.3.5.5 Supplemental heating and cooling. Supply air stream heating in the DOAS system shall comply with Section C403.7.3. Cooling is permitted for dehumidification only. Cooling coil shall be sized to meet peak dehumidification requirement at design outdoor temperatures, and no larger. Cooling coil shall be controlled to maintain supply air ~~RH~~ relative humidity or *zone* ~~RH~~ relative humidity.

EXCEPTION: Heating permitted for defrost control shall be locked out when outside air temperatures are above 35°F (2°C). Supplemental heating for defrost shall modulate to 10 percent of the peak capacity, and shall be sized to prevent frost/damage dame to the unit at design temperatures and provide supply air less than or equal to 55°F (13°C).

Commented [EVM10]: Recommending editorial change to spell out relative humidity as RH is not a defined abbreviation.

WAC 51-11C-40350 Section C403.5—Economizers.

C403.5 Economizers. Air economizers shall be provided on all new cooling systems including those serving computer server rooms, electronic equipment, radio equipment, and telephone switchgear. Economizers shall comply with Sections C403.5.1 through C403.5.5.

EXCEPTIONS:

1.. For other than Group R-2 occupancies, cooling system((s)) where the supply fan is not installed ((outdoors)) outside the *building thermal envelope* nor in a *mechanical room* adjacent to outdoors, and is installed in conjunction with DOAS complying with Section C403.3.5 and serving only spaces with year-round cooling loads from lights and equipment of less than 5 watts per square foot.

2. Unitary or packaged systems serving one zone with dehumidification that affect other systems so as to increase the overall building energy consumption. New humidification equipment shall comply with Section ((C403.3.2.5)) C403.3.2.7.

3. Unitary or packaged systems serving one zone where the cooling efficiency meets or exceeds the efficiency requirements in Table C403.5.

4. Equipment serving chilled beams and chilled ceiling space cooling systems only which are provided with a water economizer meeting the requirements of Section C403.5.4.

5. For Group R occupancies, cooling unit((s)) where the supply fan is not installed ((outdoors)) outside the *building thermal envelope* or in a *mechanical room* adjacent to outdoors with a total cooling capacity less than 20,000 Btu/h and other cooling units with a total cooling capacity less than 54,000 Btu/h provided that these are high-efficiency cooling equipment with IEER, CEER, SEER, and EER values more than 15 percent higher than minimum efficiencies listed in ((Tables C403.3.2 (1) through (3))) the tables in Section C403.3.2 or an IPLV kW/ton that is at least 15 percent lower than minimum efficiencies listed in Table C403.3.2(3) or Table C403.3.2(15), in the appropriate size category, using the same test procedures. Equipment shall be listed in the appropriate certification program to qualify for this exception. For split systems, compliance is based on the cooling capacity of individual fan coil units.

6. Equipment used to cool *Controlled Plant Growth Environments* provided these are high-efficiency cooling equipment with SEER, EER and IEER values a minimum of 20 percent greater than the values listed in Tables C403.3.2 (1), (3), (4), and (((7))) (15).

7. Equipment serving a space with year-round cooling loads from lights and equipment of 5 watts per square foot or greater complying with the following criteria:

7.1. Equipment serving the space utilizes chilled water as the cooling source; and

7.2. The chilled water plant includes a condenser heat recovery system that meets the requirements of Section C403.9.5 or the building and water-cooled system meets the following requirements:

7.2.1. A minimum of 90 percent (capacity-weighted) of the building space heat is provided by hydronic heating water.

7.2.2. Chilled water plant includes a heat recovery chiller or water-to-water heat pump capable of rejecting heat from the chilled water system to the hydronic heating equipment capacity.

7.2.3. Heat recovery chillers shall have a minimum COP of 7.0 when providing heating and cooling water simultaneously.

8. Water-cooled equipment served by systems meeting the requirements of Section C403.9.2.4 Condenser heat recovery.

9. Equipment used to cool any dedicated server room, electronic equipment room or telecom switch room provided the system complies with option a, b, or c in the table below. The total cooling capacity of all fan systems without economizers shall not exceed 240,000 Btu/h per building or 10 percent of its air economizer capacity, whichever is greater. This exception shall not be used for total building performance.

10. Dedicated outdoor air systems that include energy recovery as required by Section C403.7.6 but do not include mechanical cooling.

11. Dedicated outdoor air systems not required by Section C403.7.6 to include energy recovery that modulate the supply airflow to provide only the minimum outdoor air required by Section C403.2.2.1 for ventilation, exhaust air make-up, or other process air delivery.

	Equipment Type	Higher Equipment Efficiency	Part-Load Control	Economizer
Option a	Tables C403.3.2(1), C403.3.2(2) and C403.3.2(((2))) (14)[a]	+15%[b]	Required over 85,000 Btu/h[c]	None Required
Option b	Tables C403.3.2(1), C403.3.2(2) and C403.3.2(((2))) (14)[a]	+5%[d]	Required over 85,000 Btu/h[c]	Waterside Economizer[e]
Option c	ASHRAE Standard 127[f]	+0%[g]	Required over 85,000 Btu/h[c]	Waterside Economizer[e]

Notes for Exception 9:

[a]For a system where all of the cooling equipment is subject to the AHRI standards listed in Tables C403.3.2(1), C403.3.2(2), and C403.3.2(((2))) (14), the system shall comply with all of the following (note that if the system contains any cooling equipment that exceeds the capacity limits in Table C403.3.2(1), C403.3.2(2), or C403.3.2(((2))) (14), or if the system contains any cooling equipment that is not included in Table C403.3.2(1), C403.3.2(2), or C403.3.2(((2))) (14), then the system is not allowed to use this option).

[b]The cooling equipment shall have an EER value and an IPLV value that is a minimum of 15 percent greater than the value listed in Tables C403.3.2(1), C403.3.2(2), and C403.3.2(((2))) (14).

Commented [EVM11]: This section needs editorial corrections as it was extended to all the various equipment efficiency tables. Therefore, this would now include the following cooling equipment:
Water cooled Chillers,
Air-to-water heatpumps, and
Heat recovery chillers that are rated on kW/ton

Does this apply to heat rejection equipment efficiencies of Table C403.3.2(7) or is that on considered cooling equipment?

[c] For units with a total cooling capacity over 85,000 Btu/h, the system shall utilize part-load capacity control schemes that are able to modulate to a part-load capacity of 50 percent of the load or less that results in the compressor operating at the same or higher EER at part loads than at full load (e.g., minimum of two-stages of compressor unloading such as cylinder unloading, two-stage scrolls, dual tandem scrolls, but hot gas bypass is not credited as a compressor unloading system).

[d] The cooling equipment shall have an EER value and an IPLV value that is a minimum of 5 percent greater than the value listed in Tables C403.3.2(1), C403.3.2(2), and C403.3.2((~~(2)~~)) (14).

[e] The system shall include a water economizer in lieu of air economizer. Water economizers shall meet the requirements of C403.5.1 and C403.5.2 and be capable of providing the total concurrent cooling load served by the connected terminal equipment lacking airside economizer, at outside air temperatures of 50°F dry-bulb/45°F wet-bulb and below. For this calculation, all factors including solar and internal load shall be the same as those used for peak load calculations, except for the outside temperatures. The equipment shall be served by a dedicated condenser water system unless a nondedicated condenser water system exists that can provide appropriate water temperatures during hours when waterside economizer cooling is available.

[f] For a system where all cooling equipment is subject to ASHRAE Standard 127.

[g] The cooling equipment subject to the ASHRAE Standard 127 shall have an EER value and an IPLV value that is equal to or greater than the value listed in Tables C403.3.2(1), C403.3.2(2), and C403.3.2((~~(2)~~)) (14) when determined in accordance with the rating conditions ASHRAE Standard 127 (i.e., not the rating conditions in AHRI Standard 210/240 or 340/360). This information shall be provided by an independent third party.

Table C403.5
Equipment Efficiency Performance Exception for Economizers

Climate Zones	Efficiency Improvement[a]
4C	64%
5B	59%

[a] If a unit is rated with an IPLV, IEER or SEER then to eliminate the required air or water economizer, the minimum cooling efficiency of the HVAC unit must be increased by the percentage shown. If the HVAC unit is only rated with a full load metric like EER or COP cooling, then these must be increased by the percentage shown.

WAC 51-11C-40376 Section C403.7.6—Energy recovery ventilation systems.

C403.7.6 Energy recovery ventilation systems. Energy recovery ventilation systems shall be provided as specified in either Section C403.7.6.1 or C403.7.6.2.

C403.7.6.1 Ventilation for Group R-2 occupancy. For all Group R-2 dwelling and sleeping units, a balanced ventilation system with heat recovery system with minimum 60 percent sensible recovery effectiveness shall provide outdoor air directly to ~~all~~ each habitable space in accordance with the Mechanical Code. The ventilation system shall allow for the design flow rates to be tested and verified at each habitable space as part of the commissioning process in accordance with Section C408.2.2. The return/exhaust air stream temperature for heat recovery device selection shall be 70°F (21°C), or as calculated by the registered design professional.

Commented [EVM12]: Editorial correction to correlate to WS mechanical code language.

Commented [EVM13]: Editorial addition to correlate to Section C403.7.6.2.

C403.7.6.2 Spaces other than Group R-2 dwelling units. Any system serving a space other than a Group R-2 dwelling or sleeping unit with minimum outside air requirements at design conditions greater than 5,000 cfm or any system where the system's supply airflow rate exceeds

the value listed in Tables C403.7.6(1) and C403.7.6(2), based on the climate zone and percentage of outdoor airflow rate at design conditions, shall include an energy recovery system. Table C403.7.6(1) shall be used for all ventilation systems that operate less than 8,000 hours per year, and Table C403.7.6(2) shall be used for all ventilation systems that operate 8,000 hours or more per year. The energy recovery system shall ((~~have the capability to provide a change in the enthalpy of the outdoor air supply of not less than 50 percent of the difference between the outdoor air and return air enthalpies~~,)) provide a 68 minimum sensible recovery effectiveness or have an *enthalpy recovery ratio* of not less than 60 percent at design conditions. Where an air economizer is required, the energy recovery system shall include a bypass of the energy recovery media for both the outdoor air and exhaust air or return air dampers and controls which permit operation of the air economizer as required by Section C403.5. Where a single room or space is supplied by multiple units, the aggregate ventilation (cfm) of those units shall be used in apply- ing this requirement. The return/exhaust air stream temperature for heat recovery device selection shall be 70°F (21°C) at 30 percent relative humidity, or as calculated by the registered design professional.

Commented [EVM14]: Recommend editorial correction to correlate to C403.3.5.1.

EXCEPTION: An energy recovery ventilation system shall not be required in any of the following conditions:
1. Where energy recovery systems are restricted per Section 514 of the *International Mechanical Code* to sensible energy, recovery shall comply with one of the following:
1.1. Kitchen exhaust systems where they comply with Section C403.7.7.1.
1.2. Laboratory fume hood systems where they comply with Exception 2 of Section C403.7.6.
1.3. Other sensible energy recovery systems with the capability to provide a change in dry-bulb temperature of the outdoor air supply of not less than 50 percent of the difference between the outdoor air and the return air dry-bulb temperatures, at design conditions.
2. Laboratory fume hood systems that include at least one of the following features and also comply with Section C403.7.7.2:
2.1. Variable-air-volume hood exhaust and room supply systems configured to reduce exhaust and makeup air volume to 50 percent or less of design values.
2.2. Direct makeup (auxiliary) air supply equal to at least 75 percent of the exhaust rate, heated no warmer than 2°F (1.1°C) above room setpoint, cooled to no cooler than 3°F (1.7°C) below room setpoint, no humidification added, and no simultaneous heating and cooling used for dehumidification control.
3. Systems serving spaces that are heated to less than 60°F (15.5°C) and are not cooled.
4. Where more than 60 percent of the outdoor air heating energy is provided from site-recovered energy.
5. Systems exhausting toxic, flammable, paint or corrosive fumes or dust.
6. Cooling energy recovery.
7. Systems requiring dehumidification that employ energy recovery in series with the cooling coil.
8. Multiple-zone systems where the supply airflow rate is less than the values specified in Tables C403.7.6 (1) and (2), for the corresponding percent of outdoor air. Where a value of NR is listed, energy recovery shall not be required.
9. Equipment which meets the requirements of Section C403.9.2.4.
10. Systems serving Group R-1 ((~~and R-3~~)) dwelling or sleeping units where the largest source of air exhausted at a single location at the building exterior is less than 25 percent of the design outdoor air flow rate.

Table C403.7.6(1)
Energy Recovery Requirement
(Ventilation systems operating less than 8,000 hours per year)

Percent (%) Outdoor Air at Full Design Airflow Rate								
Climate zone	≥ 10% and < 20%	≥ 20% and < 30%	≥ 30% and < 40%	≥ 40% and < 50%	≥ 50% and < 60%	≥ 60% and < 70%	≥ 70% and < 80%	≥ 80%
Design Supply Fan Airflow Rate (cfm)								
4C, 5B	NR	NR	NR	NR	NR	NR	≥ 5000	≥ 5000

NR = Not required.

Table C403.7.6(2)
Energy Recovery Requirement
(Ventilation systems operating not less than 8,000 hours per year)

Percent (%) Outdoor Air at Full Design Airflow Rate								
Climate zone	≥ 10% and < 20%	≥ 20% and < 30%	≥ 30% and < 40%	≥ 40% and < 50%	≥ 50% and < 60%	≥ 60% and < 70%	≥ 70% and < 80%	≥ 80%
Design Supply Fan Airflow Rate (cfm)								
4C	NR	≥ 19500	≥ 9000	≥ 5000	≥ 4000	≥ 3000	≥ 1500	≥ 120
5B	≥ 2500	≥ 2000	≥ 1000	≥ 500	≥ 140	≥ 120	≥ 100	≥ 80

NR = Not required.

C403.8.4 ((~~Group R occupancy exhaust fan efficacy.~~ ~~The Group R occupancies of the building shall be provided with ventilation that meets the requirements of the *International Mechanical Code*, as applicable, or with other approved means of ventilation. Mechanical ventilation system fans with 400 cfm or less~~)) Low-capacity ~~ventilation~~ fans. Mechanical ~~ventilation system fans~~ fan systems with motors less than 1/12 hp (0.062 kW) in capacity shall meet the efficacy requirements of Table C403.8.4 at one or more rating points (corresponding airflow and static pressure selection condition).

EXCEPTIONS: 1. ((~~Group R heat recovery ventilator and energy recovery ventilator fans that are less than 400 cfm.~~)) Where ~~ventilation~~ fans are a component of a listed heating or cooling appliance.
2. ((~~Where whole house ventilation fans are integrated with forced air systems that are tested and listed HVAC equipment, provided they are powered by an electronically commutated motor where required by Section C405.8.~~)) Dryer exhaust duct power ventilators and domestic range booster fans that operate intermittently.
((~~3. Domestic clothes dryer booster fans, domestic range hood exhaust fans, and domestic range booster fans that operate intermittently.~~))

Table C403.8.4
((~~**Group R Exhaust Fan Efficacy**~~))
Low-Capacity Ventilation Fan Efficacy[a]

((~~Fan Location~~	~~Air Flow Rate Minimum (cfm)~~	~~Minimum Efficacy (cfm/watt)~~	~~Air Flow Rate Maximum (cfm)~~
~~Exhaust fan: Bathroom, utility room, whole house~~	~~10~~	~~2.8~~	~~< 90~~
~~Exhaust fan: Bathroom, utility room, whole house~~	~~90~~	~~3.5~~	~~Any~~
~~In-line (single port and multi-port) fans~~	~~Any~~	~~3.8~~	~~Any~~))

Fan Location	Airflow Rate Minimum (cfm)	Minimum Efficacy (cfm/watt)	Airflow Rate Maximum (cfm)
HRV or ERV	Any	1.2 cfm/watt	Any
Range hood	Any	2.8 cfm/watt	Any
In-line fan	Any	3.8 cfm/watt	Any
Bathroom, utility room	10	2.8 cfm/watt	< 90
Bathroom, utility room	90	3.5 cfm/watt	Any

For SI: 1 cfm/ft = 47.82 W.
[a] Airflow shall be tested in accordance with HVI 916 and listed. Efficacy shall be listed or shall be derived from listed power and airflow. Fan efficacy for fully ducted HRV, ERV, balanced and in-line fans shall be determined at a static pressure not less than 0.2 inch w.c. Fan efficacy for ducted range hoods, bathroom, and utility room fans shall be determined at a static pressure not less than 0.1 inch w.c.

Commented [AB15]: "ventilation system" is not defined in energy code, and this section includes other fan types. Recommend editorial change to "fan system".

Commented [AB16]: Editorial comment – Is it clear what rating points apply? 2018 Seattle was at 0.2" SP for ERV/HRV

WAC 51-11C-40402 Section C404.2—Service water-heating equipment performance efficiency.

C404.2 Service water-heating equipment performance efficiency. Water-heating equipment and hot water storage tanks shall meet the requirements of Table C404.2. The efficiency shall be verified through certification and *listed* under an *approved* certification program, or if no certification program exists, the equipment efficiency ratings shall be supported by data furnished by the manufacturer. Water-heating equipment intended to be used to provide space heating shall meet the applicable provisions of Table C404.2.

C404.2.1 High input-rated service water heating systems for other than Group R-1 and R-2 occupancies. In new buildings where the combined input rating of the water-heating equipment installed in a building is equal to or greater than 1,000,000 Btu/h (293 kW), the ((~~combined input-capacity-weighted-average efficiency of water-heating equipment shall be no less than the following for each water heating fuel source~~)) water-heating equipment serving occupancies other than Group R-1 and R-2 shall be one or both of the following:

1. ((~~Electric: A rated COP of not less than 2.0. For air source heat pump equipment, the COP rating will be reported at the design leaving heat pump water temperature with an entering air temperature of 60°F (15.6°C) or less~~)) Heat pump water heater.

2. Fossil fuel((~~:~~ A)) fired with a combined input-capacity-weighted-average rated E_t of not less than ((~~90~~)) 92 percent as determined by the applicable test procedure in Table C404.2.

EXCEPTIONS:
1. Where not less than 25 percent of the annual service water-heating requirement is provided from any of the following sources:
1.1. Renewable energy generated on-site that is not being used to satisfy another requirement of this code; or
1.2. Site-recovered energy that is not being used to satisfy other requirements of this code.
2. Redundant equipment intended to only operate during equipment failure or periods of extended maintenance.
3. Electric resistance heated systems installed as part of an alteration where the water heating equipment is installed at the grade level in a building with a height of four stories or greater.
4. Hot water heat exchangers used to provide service water heating from a district utility (steam, heating hot water).
5. Water heaters provided as an integral part of equipment intended to only heat or boost the heat of water used by that equipment.
6. ((~~For electric heat systems, supplemental water heaters not meeting this criteria that function as auxiliary heating only when the outdoor temperature is below 32°F (0°C) or when a defrost cycle is required are not required to have a rated COP of 2.0. Such systems shall be sized and configured to lock out electric resistance or fossil fuel heating from operation when the outdoor temperature is above 32°F (0°C) unless the system is in defrost operation.~~)) For heat pump water heater systems, supplemental electric resistance and fossil fuel water heaters that function as auxiliary heating only when the outdoor temperature is below 32°F (0°C) or when a defrost cycle is required. Such systems shall be sized and configured to lock out electric resistance or fossil fuel heating from operation when the outdoor temperature is above 32°F (0°C).
7. Systems connected to a *low-carbon district energy exchange system* or a *low-carbon district heating and cooling or heating only system.*

C404.2.2 High input-rated service water heating system for Group R-1 and R-2 occupancies. In new buildings with over 1,000,000 Btu/h installed service water heating capacity serving Group R-1 and R-2 occupancies, at least 25 percent of annual water heating energy shall be provided from any combination of the following water heating sources:

Commented [AB17]: No sizing requirements/efficiency criteria – should any language from Option 2 carry over? No exception language for electricity for point of use, small systems, only other option is fossil fuel

Would allow gas heat pump, no requirement for electric heat pump or min efficiency?

Commented [NM18]: Editorial: add exception for new low carbon district energy systems

1. Renewable energy generated on-site that is not being used to satisfy other requirements of this code; or

2. Site-recovered energy that is not being used to satisfy other requirements of this code.

EXCEPTION: Compliance with this section is not required if ((~~the combined input-capacity-weighted average equipment rating for each service water heating fuel source type is not less than~~)) all service water heating is accomplished by equipment complying with one or more of the following:

1. Electric Resistance: ((~~An electric resistance water heater with a rating of 105 percent of the rated efficiency of Table C404.2~~.)) Electric resistance water heaters with an input capacity weighted average rating exceeding the average minimum efficiency of Table C404.2 by 5 percent.

2. Electric Heat Pump (((~~(10 C.F.R. Part 430): A heat pump water heater rated in accordance with 10 C.F.R. Part 430 with a rating of 105 percent of the rated efficiency of Table C404.2~~.)):

2.1. Heat pump water heaters with rated input of 12 kW or less and rated in accordance with 10 C.F.R. Part 430.

2.2. Commercial heat pump water heaters tested in accordance with Appendix E, Subpart G of 10 C.F.R. 431. Such systems shall be sized and configured to lock out electric resistance or fossil fuel heating from operation when the outdoor temperature is above 32°F (0°C) unless the system is in defrost operation.

3. ((~~Electric Heat Pump (not listed in accordance with 10 C.F.R. Part 430): A heat pump water heater not rated in accordance with 10 C.F.R. Part 430 shall have a COP of not less than 2.0. For air-source heat pump equipment the COP rating will be reported at the design leaving heat pump water temperature with an entering air temperature of 60°F (15.6°C) or less. Supplemental water heaters not meeting the above criteria that function as auxiliary heating only when the outdoor temperature is below 32°F (0°C) or when a defrost cycle is required are not required to have a rated COP of 2.0. Such systems shall be sized and configured to lock out electric resistance or fossil fuel heating from operation when the outdoor temperature is above 32°F (0°C) unless the system is in defrost operation.~~

~~4.~~)) Fossil Fuels: ((~~A~~)) Fossil fuel water heaters with an input capacity weighted rated E_t of not less than ((~~90~~)) 92 percent as determined by the applicable test procedures in Table C404.2.

((~~5.~~)) 4. Hot water heat exchangers used to provide service water heating from a district utility (steam, heating hot water).

5. Systems connected to a *low-carbon district energy exchange system* or a *low-carbon district heating and cooling or heating only system*~~.~~.

Commented [NM19]: Editorial: add exception for new low carbon district energy systems

OPTION 2

AMENDATORY SECTION (Amending WSR 20-21-080, filed 10/19/20, effective 2/1/21)

WAC 51-11C-40402 Section C404.2—Service water-heating equipment performance efficiency.

C404.2 Service water-heating equipment performance efficiency. Water-heating equipment and hot water storage tanks shall meet the requirements of Table C404.2. The efficiency shall be verified through certification and *listed* under an *approved* certification program, or if no certification program exists, the equipment efficiency ratings shall be supported by data furnished by the manufacturer. Water-heating equipment intended to be used to provide space heating shall meet the applicable provisions of Table C404.2.

((~~**C404.2.1 High input-rated service water heating systems for other than Group R-1 and R-2 occupancies.** In new buildings where the combined input rating of the water-heating equipment installed in a building is equal to or greater than 1,000,000 Btu/h (293 kW), the combined input capacity weighted average efficiency of water heating equipment shall be no less than the following for each water heating fuel source:~~

~~1. Electric: A rated COP of not less than 2.0. For air-source heat pump equipment, the COP rating will be reported at the design leaving heat pump water temperature with an entering air temperature of 60°F (15.6°C) or less.~~

~~2. Fossil Fuel: A rated E_t of not less than 90 percent as determined by the applicable test procedure in Table C404.2.~~

~~EXCEPTIONS:~~ ~~1. Where not less than 25 percent of the annual service water heating requirement is provided from any of the following sources:~~
~~1.1. Renewable energy generated on site that is not being used to satisfy another requirement of this code; or~~
~~1.2. Site-recovered energy that is not being used to satisfy other requirements of this code.~~
~~2. Redundant equipment intended to only operate during equipment failure or periods of extended maintenance.~~
~~3. Electric resistance heated systems installed as part of an alteration where the water heating equipment is installed at the grade level in a building with a height of four stories or greater.~~
~~4. Hot water heat exchangers used to provide service water heating from a district utility (steam, heating hot water).~~
~~5. Water heaters provided as an integral part of equipment intended to only heat or boost the heat of water used by that equipment.~~
~~6. For electric heat systems, supplemental water heaters not meeting this criteria that function as auxiliary heating only when the outdoor temperature is below 32°F (0°C) or when a defrost cycle is required are not required to have a rated COP of 2.0. Such systems shall be sized and configured to lock out electric resistance or fossil fuel heating from operation when the outdoor temperature is above 32°F (0°C) unless the system is in defrost operation.~~

~~**C404.2.2 High input rated service water heating system for Group R-1 and R-2 occupancies.** In new buildings with over 1,000,000 Btu/h installed service water heating capacity serving Group R-1 and R-2 occupancies, at least 25 percent of annual water heating energy shall be provided from any combination of the following water heating sources:~~

~~1. Renewable energy generated on site that is not being used to satisfy other requirements of this code; or~~

~~2. Site-recovered energy that is not being used to satisfy other requirements of this code.~~

~~EXCEPTION:~~ ~~Compliance with this section is not required if the combined input capacity weighted average equipment rating for each service water heating fuel source type is not less than the following:~~
~~1. Electric Resistance: An electric resistance water heater with a rating of 105 percent of the rated efficiency of Table C404.2.~~
~~2. Electric Heat Pump (10 C.F.R. Part 430): A heat pump water heater rated in accordance with 10 C.F.R. Part 430 with a rating of 105 percent of the rated efficiency of Table C404.2.~~
~~3. Electric Heat Pump (not listed in accordance with 10 C.F.R. Part 430): A heat pump water heater not rated in accordance with 10 C.F.R. Part 430 shall have a COP of not less than 2.0. For air source heat pump equipment the COP rating will be reported at the design leaving heat pump water temperature with an entering air temperature of 60°F (15.6°C) or less. Supplemental water heaters not meeting the above criteria that function as auxiliary heating only when the outdoor temperature is below 32°F (0°C) or when a defrost cycle is required are not required to have a rated COP of 2.0. Such systems shall be sized and configured to lock out electric resistance or fossil fuel heating from operation when the outdoor temperature is above 32°F (0°C) unless the system is in defrost operation.~~
~~4. Fossil Fuels: A rated E_t of not less than 90 percent as determined by the applicable test procedures in Table C404.2.~~
~~5. Hot water heat exchangers used to provide service water heating from a district utility (steam, heating hot water).~~))

C404.2.1 Service water heating system type. Service water-heating equipment shall not use fossil fuel combustion or electric resistance. Service hot water shall be provided by an electric air-source heat pump water heating (HPWH) system meeting the requirements of this section. Supplemental service water heating equipment is permitted to use electric resistance in compliance with Section C404.2.1.4.

EXCEPTIONS:
1. 24 kW plus 0.1 watts per square foot of building area of electric resistance service water heating capacity is allowed per building.
2. Solar thermal, wastewater heat recovery, other *approved* waste heat recovery, ground source heat pumps, water-source heat pump systems utilizing waste heat, and combinations thereof, are permitted to offset all or any portion of the required HPWH capacity where such systems comply with this code and the *Uniform Plumbing Code*.
3. Systems that comply with the Northwest Energy Efficiency Alliance (NEEA) Commercial Electric Advanced Water Heating Specification.
4. Service hot water systems served by a district energy system that serves multiple buildings and that was in service before the effective date of this code.
~~1.~~ ~~5.~~ Commercial dishwashers, commercial food service equipment, and other *approved* process equipment are permitted to utilize electric booster heaters for supply water temperatures 120°F (49°C) or higher.
~~1.~~2. Systems connected to a *low-carbon district energy exchange system* or a *low-carbon district heating and cooling or heating only system.*~~*Add Low Carbon District Energy exception~~

C404.2.1.1 Primary heat pump system sizing. The system shall include a primary service output of 100 percent load at 40°F (4°C) dry bulb or wet bulb outdoor air temperature for air-source heat pumps, or 44°F (7°C) ground temperature for ground-source heat pumps that provides sufficient hot water as calculated using the equipment manufacturer's selection criteria or another *approved* methodology. Electric air source heat pumps shall be sized to deliver no less than 50 percent of the calculated demand for hot water production during the peak demand period when entering dry bulb or wet bulb outdoor air temperature of 24°F (-4°C).

EXCEPTION: Fifty percent sizing at entering dry bulb or wet bulb air temperature of 24°F (-4°C) is not required for air-source heat pumps located in a below-grade enclosed parking structure or other ventilated and unconditioned space that is not anticipated to fall below 40°F (4°C) at any time.

Commented [EVM20]: Editorial correction to include exceptions for low carbon district energy system that were discussed during the TAG proposal review and missed being added.

C404.2.1.2 Primary hot water storage sizing. The system shall provide sufficient hot water to satisfy peak demand period requirements.

C404.2.1.3 System design. The service water heating system shall be configured to conform to one of the following provisions:

1. For *single-pass* HPWHs, *temperature maintenance* heating provided for reheating return water from the building's heated water circulation system shall be physically decoupled from the primary service water heating system storage tank(s) in a manner that prevents destratification of the primary system storage tanks. *Temperature maintenance* heating is permitted to be provided by electric resistance or a separate dedicated heat pump system.

2. For *multi-pass* HPWHs, *recirculated temperature* maintenance water is permitted to be returned to the primary water storage tanks for reheating.

3. For unitary HPWHs, located in conditioned space, are permitted, where they are sized to meet all calculated service water heating demand using the heat pump compressor, and not supplementary heat.

C404.2.1.3.1 Mixing valve. A thermostatic mixing valve capable of supplying hot water to the building at the user temperature setpoint shall be provided, in compliance with requirements of the *Uniform Plumbing Code* and the HPWH manufacturer's installation guidelines. The mixing valve shall be sized and rated to deliver tempered water in a range from the minimum flow of the *temperature maintenance* recirculation system up to the maximum demand for the fixtures served.

C404.2.1.4 Supplemental water heating. Total supplemental electric resistance water heating equipment shall not have an output capacity greater than the primary water heating equipment at 40°F (4°C) entering dry bulb or wet bulb outdoor air temperature for air-source heat pumps or 44°F (7°C) ground temperature for ground-source heat pumps. Supplemental electric resistance heating is permitted for the following uses:

1. *Temperature maintenance* of heated-water circulation systems, physically separate from the primary service water heating system. *Temperature maintenance* heating capacity shall be no greater than the primary water heating capacity at 40°F (4°C) dry bulb or wet bulb outdoor air temperature for air-source heat pumps or 44°F (7°C) ground temperature for ground-source heat pumps.

2. Defrost of compressor coils.

3. Heat tracing of piping for freeze protection or for *temperature maintenance* in lieu of recirculation of hot water.

4. Backup or low ambient temperature conditions, where all of the following are true:

4.1. The supplemental heating capacity is no greater than the primary service water heating capacity at 40°F (4°C) dry bulb or wet bulb outdoor air temperature for air-source heat pumps or 44°F (7°C) ground temperature for ground-source heat pumps.

4.2. During normal operations, the supplemental heating is controlled to operate only when the entering air temperature at the air-source HPWH is below 40°F (4°C), and the primary HPWH compressor continues to operate together with the supplemental heating when the entering air temperature is between 17°F (-8°C) and 40°F (4°C).

4.3. The primary water heating equipment cannot satisfy the system load due to equipment failure or entering air temperature below 40°F (4°C).

~~**C404.2.1.5 Alarms.** The control system shall be capable of and configured to send automatic error alarms to building or maintenance personnel upon detection of equipment faults, low leaving water temperature from primary storage tanks, or low hot water supply delivery temperature to building distribution system.~~

Commented [EVM21]: Editorial comment recommend removing this alarms section as this is not an energy code requirement and is not required for non heat pump service water heating systems.

C405.7.1 Electric receptacles at dwelling unit gas appliances. Where *dwelling unit* appliances are served by natural gas, an electrical receptacle or junction box and circuit shall be provided at each gas appliance with sufficient capacity to serve a future electric appliance in the same location. The receptacles and circuits shall be included in the electrical service load calculation and shall meet the requirements of items 1 through 3 below. The receptacle or junction box for each gas appliance shall be located within 12 inches of the appliance and without obstructions between the appliance and the outlet. An electric receptacle is not required for a decorative gas fireplace.

1. Each gas range, cooktop, or oven, or combination appliance, location shall be served by a dedicated 240/208-volt, 40-amp receptacle connected to the *dwelling unit* electric panel with a 3-conductor branch circuit complying with 210.19(A)(3) of the NEC as adopted by Washington state and a minimum included load of 9600 VA for 240-volt systems or 8000 VA for 208-volt systems.

2. Each gas clothes dryer location shall be served by a dedicated 240/208-volt, 30-amp receptacle connected to the *dwelling unit* electric panel with a 3-conductor branch circuit and a minimum included load of 5000 VA.

3. Each gas domestic water heater, installed within a dwelling unit, the location shall be served by a dedicated 240/208-volt, 30-amp junction box connected to the *dwelling unit* electrical panel with a 3-conductor branch circuit and a minimum included load of 4500 VA.

Commented [EVM22]: Editorial clarification recommended to clarify that central NG domestic water heaters do not require these electric receptacles. This only applies to water heaters installed within the dwelling unit.

C406.1.1 Tenant spaces. An initial tenant improvement shall comply with sufficient ((~~packages~~)) measures from Table ((~~C406.1~~)) C406.2 to achieve a minimum ((~~number of six~~)) of efficiency credits required in Table C406.1 and are not required to achieve any load management credits. In ((~~buildings~~)) projects with multiple tenant spaces, each tenant space is permitted to apply for differ~~ent ((packages))~~ measures provided the weighted average of all areas in the ((~~building~~)) project

Commented [EVM23]: Recommend that code is clarified that tenant improvements are tracked under the energy code edition that the core shell building was covered under for C406. For example:
If core shell was permitted under 2015 WSEC-C then first tenant improvement would be under 2015 WSEC-C for C406.
Same for 2018 WSEC-C & 2021 WSEC-C

comply with the overall efficiency credit requirement ((~~for six credits~~)) in Table C406.1. Whole building or addition energy credits shall be allocated to tenant spaces in accordance with Sections C406.1.1.1 and C406.1.1.2.

EXCEPTIONS: 1. An initial tenant improvement where the core and shell building complied via Section C407 in 2018 or later edition of the Washington State Energy Code.
2. Previously occupied tenant spaces in existing buildings that comply with this code in accordance with Section C501.

C406.1.1.1 Applicable envelope ((~~and~~)), on-site renewable and elevator energy credits. Where an entire building or building addition complies with Section ((~~C406.5, C406.10 or C406.11~~)) C406.2.4, C406.2.9, C406.2.10, or C406.2.14, under an initial tenant improvement permit, tenant spaces within the building qualify for the number of credits assigned to the occupancy ((~~type~~)) group of the tenant space in accordance with Table ((~~C406.1~~)) C406.2. Where prior energy credits were achieved under the 2018 Washington State Energy Code, they shall be multiplied by 6 for applicability to this code.

C406.1.1.2 Applicable HVAC and service water heating credits. Where HVAC and service water heating systems and services are installed and comply with Section ((~~C406.2 or C406.8~~)) C406.2.4, C406.2.9, C406.2.10, or C406.2.14 under an initial tenant improvement permit, those systems and services shall be considered a part of the tenant space. Tenant spaces qualify for the credits assigned to the occupancy ((~~type~~)) group of the tenant space in accordance with Table ((~~C406.1~~)) C406.2 if the tenant space includes the distribution system and equipment that the central HVAC systems or service water heating systems were designed to support.

((~~EXCEPTION: Previously occupied tenant spaces in existing buildings that comply with this code in accordance with Section C501.~~))

C406.1.2 Discrete area-weighted project ~~projects~~compliance. Discrete building areas shall be permitted to ~~achieve credits using~~select different packages of measures provided that the whole project complies with both the energy and load management credit requirements. Compliance shall be determined as follows:

1. Project credit requirement shall be the individual occupancy group requirements from Table C406.1 for each discrete area, weighted by discrete area *conditioned floor area*.
2. Determine the energy and load management credits achieved for each discrete area based on its occupancy group.
3. Determine total project credits achieved by weighting individual discrete area credits by discrete area *conditioned floor area*.
4. A project complies when both energy and load management credits are equal to or greater than the weighted project requirement.

NEW SECTION

WAC 51-11C-40620 Section C406.2—Additional energy efficiency credit measures.

C406.2 Additional energy efficiency credit measures. Each energy efficiency credit measure used to meet credit requirements for the project shall include efficiency that is greater than the energy efficiency required for the building type and configuration requirements in Sec-

Commented [EVM24]: What is the correction factor for buildings permitted under the 2015 WSEC-C?
There are still spaces in these buildings that have not been built out as they were core shell for future retail and other office tenant improvements.

Commented [NM25]: Editorial changes to make it clear this provides compliance path for using different package of measures in different discrete areas of the project as long as area-weighted compliance is achieved

tions C402 through C405. Measures installed in the project that meet the requirements in Sections C406.2.1 through C406.2.14 shall achieve the credits listed for the measure and occupancy group in Table C406.2 or where calculations required by Sections C406.2.1 through C406.2.14 create or modify the table credits, the credits achieved shall be based upon the section calculations.

Table C406.2
Efficiency Measure Credits

Measure Title	Applicable Section	Occupancy Group					
		Group R-1	Group R-2	Group B	Group E	Group M	All Other
1. Dwelling unit HVAC control	C406.2.1	NA	7	NA	NA	NA	NA
2. Improved HVAC TSPR[a]	C406.2.2.1	NA	8	11	17	22	NA
3. Improve cooling and fan efficiency	C406.2.2.2	2	1	2	2	3	2
4. Improve heating efficiency	C406.2.2.3	2	3	3	10	16	7

Measure Title	Applicable Section	Occupancy Group					
		Group R-1	Group R-2	Group B	Group E	Group M	All Other
5. Improved Low-carbon district energy system (10% Better) ~~(45% annual district system net load met)~~	C406.2.2.4	3	3	4	11	17	8
6. Improved low-carbon district energy system (20% Better) ~~(50% annual district system net load met)~~[b]	C406.2.2.5	9	10	12	33	52	24
7. High performance DOAS	C406.2.2.6	31	31	21	39	40	21/ (A) 40[c]
8. Fault detection & diagnostics (FDD)	C406.2.2.7	2	2	2	6	9	4
9. 10% reduced lighting power	C406.2.3.1	7	4	18	16	20	15
10. 20% reduced lighting power[d]	C406.2.3.2	13	8	36	32	40	29
11. Lamp efficacy improvement	C406.2.3.3	5	6	NA	NA	NA	NA
12. Residential lighting control	C406.2.4.1	NA	8	NA	NA	NA	NA
13. Enhanced lighting control	C406.2.4.2	1	1	6	6	11	6
14. Renewable energy	C406.2.5	7	12	13	13	10	11
15. Shower drain heat recovery	C406.2.6.1	9	30	NA	3	NA	NA
16. Service water heat recovery	C406.2.6.2	35	111	13	14	(Grocery) 41[e]	NA
17. Heat pump water heating	C406.2.6.3	NA	NA	17	33	(Grocery) 95[e]	(A-2) 95[f]
Note: If proposal 21-GP1-136 is not included in the final WSEC, then replace the row above with the following:							
17. Heat pump water heating	C406.2.6.3	81	261	17	33	(Grocery) 95[e]	(A-2) 95[f]
18. Heat trace system	C406.2.7.1	6	13	4	1	NA	6
19. Point of use water heater	C406.2.7.2	NA	NA	19	5	NA	NA
20. Service hot water distribution right sizing	C406.2.8	13	42	NA	NA	NA	NA
21. High performance service hot water temperature maintenance system	C406.2.9	TBD	TBD	TBD	TBD	TBD	TBD
22. High efficiency service hot water circulation system	C406.2.10	3	6	2	1	NA	4
23. Low flow residential showerheads	C406.2.11	3	3	NA	NA	NA	NA
24. Enhanced envelope performance[g]	C406.2.12	24	20	13	5	19	14
25. Base reduced air infiltration[g]	C406.2.13.2	29	24	6	3	9	11
26. Enhanced reduced air infiltration[g]	C406.2.13.3	53	44	11	5	16	20
27. Enhanced commercial kitchen equipment	C406.2.14	30[h]	18[h]	18[h]	30[h]	30[h]	31[h]
28. Enhanced residential kitchen equipment	C406.2.15	12	19	NA	NA	NA	NA
29. Enhanced residential laundry equipment	C406.2.16	NA	6	NA	NA	NA	NA
30. Heat pump clothes dryers	C406.2.17	6	6	NA	NA	NA	NA
31. Efficient elevator equipment	C406.2.18	3	5	5	5	4	4

[a] Projects using Item 2 shall not use Items 3 through 5.
[b] Projects using C406.2.2.5 shall not use C406.2.2.4.
[c] For C406.2.2.6, occupancy Group A achieves 40 credits while other occupancy groups within the "all other" category achieve 21 credits.
[d] Projects using C406.2.3.2 shall not use C406.2.3.1.
[e] Service water heat recovery and heat pump water heating are available in Group M only for grocery stores larger than 10,000 ft^2. Large mixed retail with full grocery and butcher sections shall achieve half the credits.

Commented [NM26]: Editorial- previous summarized title was on accurate for one of two low carbon district types.

Commented [NM27]: Editorial- previous summarized title was on accurate for one of two low carbon district types.

F Heat pump water heating efficiency credits are available in the ""all other"" category only for Group A-2.
G Buildings or building areas that are exempt from the thermal envelope requirements in accordance with Sections C402.1.1 and C402.1.2, do not qualify for this package.
H Additional energy efficiency credits, up to the maximum shown in Table C406.2, shall be calculated according to Section C406.2.11.

NEW SECTION

WAC 51-11C-40622 Section C406.2.2—HVAC measures. C406.2.2 More efficient HVAC system performance. All heating and cooling systems shall meet the minimum requirements of Section C403 and efficiency improvements shall be referenced to the minimum efficiency requirements listed in the tables in Section C403.3.2. Where multiple efficiency requirements are listed, equipment shall meet the seasonal efficiencies including SEER, EER/IEER, IPLV or AFUE. Equipment that is larger than the maximum capacity range indicated in the tables in Section C403.3.2 shall utilize the values listed for the largest capacity equipment for the associated equipment type shown in the table. Where multiple individual heating or cooling systems serve the project, the improvement shall be the weighted average improvement based on individual system capacity.

For occupancies and systems required to comply with Section C403.1.1, credits are permitted to be achieved by meeting the requirements of Section C406.2.2.1. Other systems are permitted to achieve credits by meeting the requirements of either:

1. Section C406.2.2.2, More efficient HVAC equipment cooling and fan performance.
2. Section C406.2.2.3, More efficient HVAC equipment heating performance.
3. Section C406.2.2.4, High performance dedicated outdoor air system (DOAS).
4. Any combination of Sections C406.2.2.2, C406.2.2.3, and C406.2.2.4.

In addition, energy credits are permitted to be achieved for Section C406.2.2.~~5~~7, Fault detection and diagnostics, where not otherwise required by Section C403.2.3 or C403.6.10(15).

Commented [NM28]: Making sure this references the correct C406 section for fault detections

C406.2.2.1 Improved HVAC TSPR. For systems required to comply with Section C403.1.1, the *HVAC TSPR* shall exceed the minimum requirement by five percent. If improvement is greater, the credits in Table C406.2 are permitted to be prorated up to a 20 percent improvement.

C406.2.2.2 More efficient HVAC equipment cooling and fan performance. No less than 90 percent of the total HVAC capacity serving the total *conditioned floor area* of the entire building, building addition or tenant space in accordance with Section C406.1.1 shall comply with Sections C406.2.2.2.1 through C406.2.2.2.3. Where individual equipment efficiencies vary, weigh them based on capacity.

C406.2.2.2.1 HVAC system selection. Equipment installed shall be types that are listed in the tables in Section C403.3.2.

C406.2.2.2.2 Cooling equipment efficiency. Equipment shall exceed the minimum cooling efficiency requirements listed in the tables in Section C403.3.2 by at least 5 percent. Where equipment exceeds the minimum annual cooling efficiency and heat rejection efficiency requirements by more than 5 percent, energy efficiency credits for cooling shall be determined using Equation 4-15, rounded to the nearest whole number.

(Equation 4-15)

$$EEC_{HEC} = EEC_5 \times \left[1 + \frac{CEI - 5\ percent}{5\ percent}\right]$$

Where:

EEC_{HEC}	=	Energy efficiency credits for cooling efficiency improvement.
EEC_5	=	Section C406.2.2.2 credits from Table C406.2.
CEI	=	The lesser of the improvement above minimum cooling efficiency requirements, minimum heat rejection efficiency requirements, or 20 percent. Where cooling efficiency varies by system, use the capacity weighted average efficiency improvement for all cooling equipment combined. Where cooling rating reduces as efficiency increases, base the efficiency improvement on the inverse of the rating.

C406.2.2.2.3 Minimum fan efficiency. Where fan energy is not included in packaged equipment rating or it is and the fan size has been increased from the as-rated equipment condition, fan power or horsepower shall be less than 95 percent of the allowed fan power in Section C403.8.1.

C406.2.2.3 More efficient HVAC equipment heating performance. No less than 90 percent of the total HVAC capacity serving the total *conditioned floor area* of the entire building, building addition or tenant space in accordance with Section C406.1.1 shall comply with Sections C406.2.2.3.1 through C406.2.2.3.2.

C406.2.2.3.1 HVAC system selection. Equipment installed shall be types that are listed in the tables in Section C403.3.2. Electric resistance heating shall be limited to 20 percent of system capacity, with the exception of heat pump supplemental heating.

C406.2.2.3.2 Heating equipment efficiency. Equipment shall exceed the minimum heating efficiency requirements of the tables in Section C403.3.2 by at least 5 percent. Where equipment exceeds the minimum annual heating efficiency requirements by more than 5 percent, energy efficiency credits for heating shall be determined using Equation 4-16, rounded to the nearest whole number.

(Equation 4-16)

$$EEC_{HEH} = EEC_5 \times \left[1 + \frac{CEI - 5\ percent}{5\ percent}\right]$$

Where:

EEC_{HEH}	=	Energy efficiency credits for heating efficiency improvement.
EEC_5	=	Section C406.2.2.2 credits from Table C406.2.
CEI	=	The lesser of the improvement above minimum heating efficiency requirements or 20 percent. Where heating efficiency varies by system, use the capacity weighted average percentage for all heating equipment combined.

EXCEPTION: In low energy spaces complying with Section C402.1.1 and *semi-heated spaces* complying with Section C402.1.1.2, no less than 90 percent of the installed heating capacity is provided by electric infrared or gas-fired radiant heating equipment for localized heating applications. Such spaces shall achieve credits for EEC_5.

C406.2.2.4 Improved Low-carbon district energy systems (10% Better). Not less than 90 per- cent of the annual service hot water and space heating load, or not less than 90 percent of the annual service hot water, space heating, and space cooling load shall meet the criteria of Section C406.2.2.4.1 or C406.2.2.4.2.

Documentation for the low-carbon district system that is operational prior to the final inspection shall be provided to demonstrate that the definition as modified in C406.2.2.4.1 or C406.2.2.4.2 of *low-carbon district energy exchange system* is satisfied.

C406.2.2.4.1 Improved Low-carbon district energy exchange systems (10% Better). Low-carbon district energy exchange systems must demonstrate the following:

1. Forty-five percent of the annual district-system-net-load-met (sum of heating and cooling energy provided to attached buildings)

Commented [NM29]: For all of C406.2.2.4, since *low- carbon district energy exchange systems* AND *low-carbon district heating and cooling or heating only systems* are already defined terms in chapter two, it made sense to clarify in the section titles that the C406 credits are based on achieving IMPROVEMENTS over the base defined requirements. The way it was originally written it wasn't obvious that the C406 credits weren't just restating and contradicting the definitions from chapter 2.

comes from heat recovery between connected buildings, waste heat, or renewable energy resources and no more than 25 percent of the annual heat input to the system comes from fossil fuel or electric-resistance sources.

C406.2.2.4.2 Improved Low-carbon district energy heating and cooling or heating only systems (10% Better). Distribution losses must be accounted for and may not exceed 5 percent of the annual load delivered to buildings served by the system. *Low-carbon district energy heating and cooling or heating only systems* must demonstrate ~~one of~~ the following:

1. Forty-five percent of the annual district-system-net-load-met (sum of heating and cooling energy provided to attached buildings) comes from heat recovery between connected buildings, waste heat, or renewable energy resources and no more than 25 percent of the annual heat input to the system comes from fossil fuel or electric-resistance sources; or.

2. No more than 10 percent of the system annual heat input to the system comes from fossil fuels or electric-resistance sources. The remaining annual heat input must be provided using heat pump technology with a minimum annual operating COP of 3.0.

C406.2.2.5 Improved low-carbon district energy systems (20% Better). Not less than
90 percent of the annual service hot water and space heating load, or not less than 90 percent of the annual service hot water, space heating, and space cooling load shall meet the criteria of Section C406.2.2.5.1 or C406.2.2.5.2.

Documentation for the low-carbon district system that is operational prior to the final inspection shall be provided to demonstrate that the definition as modified in C406.2.2.5.1 or C406.2.2.5.2 of *low-carbon district energy exchange system* is satisfied.

C406.2.2.5.1 Improved Low-carbon district energy exchange systems (20% Better). Low-carbon district energy exchange systems must demonstrate the following:

1. Fifty percent of the annual district-system-net-load-met (sum of heating and cooling energy provided to attached buildings) comes from heat recovery between connected buildings, waste heat, or renewable energy resources and no more than 10 percent of the annual heat input to the system comes from fossil fuel or electric-resistance sources.

C406.2.2.5.2 Improved Low-carbon district energy heating and cooling or heating only systems (20% Better). Distribution losses must be accounted for and may not exceed 5 percent of the annual load delivered to buildings served by the system. *Low-carbon district energy heating and cooling or heating only systems* must demonstrate ~~one of~~ the following:

1. Fifty percent of the annual district-system-net-load-met (sum of heating and cooling energy provided to attached buildings) comes from heat recovery between connected buildings, waste heat, or renewable energy resources and no more than 10 percent of the annual heat input to the system comes from fossil fuel or electric-resistance sources, or.

2. No more than 10 percent of the system annual heat input to the system comes from fossil fuels or electric-resistance sources. The remaining annual heat input must be provided using heat pump technology with a minimum annual operating COP of 4.0.

Commented [NM30]: Deleted "one of" to be consistent with how low-carbon district systems are defined in chapter 2. I don't care which way it's written, but consistency will result in less confusion. This edit goes hand-in-hand with adding the "or" statement between 1 + 2

Commented [NM31]: To be consistent with the definition in chapter two, this is a "or" between 1 & 2.

Commented [NM32]: Deleted "one of" to be consistent with how low-carbon district systems are defined in chapter 2. I don't care which way it's written, but consistency will result in less confusion. This edit goes hand-in-hand with adding the "or" statement between 1 + 2

Commented [NM33]: To be consistent with the definition in chapter two, this is a "or" between 1 & 2.

C406.2.2.6 High performance dedicated outdoor air system (DOAS). No less than 90 percent of the total conditioned floor area of the whole project, excluding floor area of unoccupied spaces that do not require ventilation as specified by the *International Mechanical Code*, shall be served by DOAS installed in accordance with Section C403.3.5 with the following adjustments:

1. Minimum heat recovery sensible effectiveness of 80 percent, calculated in accordance with Section C403.3.5.1.

2. Where design outdoor airflow is greater than 500 cfm (250 L/s), the DOAS shall be equipped with an economizer bypass, damper control, or wheel speed control that is active between 55°F (13°C) and 75°F (24°C) and minimizes energy recovery or maintains an appropriate DOAS leaving air temperature when the building is generally in cooling, based either on outdoor air temperature or a DDC zone-based cooling system reset.

3. DOAS total combined fan power shall be less than either:

3.1. 0.769 W/cfm (1.55 W/L/s) when calculated in accordance with Section C403.3.5.2.

3.2. Eighty percent of fan power allowance for a constant volume system when calculated in accordance with Section C406.8.1.

This option is not available to areas served by systems utilizing Section C403.2.2.1 exception 5.

C406.2.2.7 Fault detection and diagnostics system. A project not required to comply with Section C403.2.3 or C403.6.10(15) shall achieve energy credits for installing a fault detection and diagnostics system to monitor the HVAC system's performance and automatically identify faults. The installed system shall comply with items 1 through 6 in Section C403.2.3.

WAC 51-11C-40624 Section C406.2.5—Renewable energy measures.

C406.2.4 On-site and off-site renewable energy. Projects installing on-site or off-site renewable energy systems with a capacity of at least 0.1 watts per gross square foot (1.08 W/m^2) of building area in addition to the renewable energy capacity required elsewhere in this code shall achieve energy credits for this measure. Renewable energy systems achieving energy credits shall not be used to satisfy other requirements of this code. Off-site renewable energy systems shall comply with Sections C411.2.2 and C411.2.3. Credits shall be prorated from the table value in accordance with Equation 4-17.

(Equation 4-17)

$$\mathrm{AEC_{RRa}} = \mathrm{AEC_{0.1}} \times \left[\frac{\mathrm{RR}_t - RR_r}{0.1 \times \mathrm{PGFA}}\right] \times \mathrm{REF}$$

Where:

AEC_{RRa}	=	Section C406.2.5 achieved energy credits for this project as calculated in accordance with Equation 4-17, limited to 50 percent of the required credits in Section C406.1.
RR_t	=	Actual total rating of on-site renewable energy systems (W).
RR_r	=	Rating of on-site renewable energy systems required by other sections in this code or used to qualify for exceptions in this code (W).
PGFA	=	The lesser of the improvement above minimum heating efficiency requirements or 20 percent. Where heating efficiency varies by system, use the capacity weighted average percentage for all heating equipment combined.
$AEC_{0.1}$	=	Section C406.2.5 base credits from Table C406.2.
REF	=	Renewable Energy Factor from Table C411.3.1.

Informative Note: On-site renewable energy may include thermal service water heating or pool water heating, in which case ratings in Btu/h can be converted to W where W = Btu/h / 3.413.

Commented [AB34]: Should this be Project Gross Floor Area (PGFA)? Seems to be copy-paste text from the HVAC C406 credit formula.

WAC 51-11C-40625 Section C406.2.6—Service water measures.

C406.2.6 Reduced energy use in service water heating. Buildings with service hot water heating equipment that serves the whole building, building addition or tenant space shall achieve credits through compliance with either:

1. Section C406.2.6.1, C406.2.6.2, or C406.2.6.3.
2. Section C406.2.6.1 and Section C406.2.6.2 or C406.2.6.3.

C406.2.6.1 Shower drain heat recovery. Shower drain heat recovery units shall comply with Section C404.10 and preheat cold water supply to the showers. Portable waterside pressure loss shall be less than 10 psi (69 kPa) at maximum design flow. The efficiency of drain water heat recovery units shall be 54 percent in accordance with CSA B55.1. Full credits are applicable to the following building use types: Multi-family, hotel, motel, dormitory, and schools with locker room showers. Where not all showers in the project have drain heat recovery, the credit is adjusted based on the following:

[Section C406.2.6.1 table credits] x [Showers with drain recovery] / [Total number of showers]

Commented [NM35]: C404.10 is not included in this draft version of the code. It appears C404.8-C404.10 are missing.

C406.2.6.2 Service water heating energy recovery. Not less than 30 percent of the annual service hot water heating energy use, or not less than 70 percent of the annual service hot water heating energy use in buildings with ~~water-cooled chiller~~condenser water systems subject to the requirements of Section C403.9.2.1 or qualifying for one of its exceptions, shall be provided by one or more of the following:

Commented [NM36]: Intent would be to include WSHP condenser loops, not just chiller condenser loops. Suggested text matches C403.9.2.1 title.

1. Waste heat recovery from service hot water, heat recovery chillers, building equipment, process equipment, or other *approved* system. Qualifying heat recovery must be above and beyond heat recovery required by other sections of this code.

2. On-site renewable energy water-heating systems where not used to meet other requirements or to obtain other energy credits.

WAC 51-11C-40626 Section C406.2—Envelope measures.

C406.2.12 Enhanced envelope performance. The Proposal Total UA of the thermal envelope of the project shall be 15 percent lower than the Allowable Total UA for an area of identical configuration and fenestration area in accordance with Section C402.1.5 and Equation 4-2.

C406.2.13 Reduced air infiltration. Energy credits shall be achieved where measured air infiltration of the total *conditioned floor area* of the whole building, fully isolated building addition or tenant space is determined in accordance with Section C406.13.1 and complies with the maximum leakage in either Section C406.2.13.2 or C406.2.13.3.

C406.2.13.1 Air leakage testing and verification. Air infiltration shall be verified by whole building pressurization testing conducted in accordance with ASTM E779 or ASTM E1827 by an independent third party. The measured air leakage rate of the building thermal envelope shall not exceed the specified maximum air leakage in cfm/ft^2 (L/s per m^2) under a pressure differential of 0.3 in. water gauge (75 Pa), with the calculated surface area being the sum of the above and below grade *building thermal envelope*. A report that includes the tested surface area, floor area, air by volume, stories above grade, and leakage rates shall be submitted to the code official and the building owner.

EXCEPTION: Where the *conditioned floor area* of the building is not less than 250,000 ft^2 (25,000 m^2), air leakage testing shall be permitted to be conducted on representative above grade sections of the building provided the *conditioned floor area* of tested areas is no less than 25 percent of the *conditioned floor area* of the building and are tested in accordance with this section.

C406.2.13.2 Base reduced air infiltration. Measured air infiltration determined in accordance with Section C406.13.1 shall not exceed 0.17 cfm/ft^2 (0.86 L/s per m^2).

C406.2.13.3 Enhanced reduced air infiltration. Measured air infiltration determined in accordance with Section C406.13.1 shall not exceed ~~0.8~~0.08 cfm/ft^2 (0.41 L/s per m^2).

Commented [NM37]: Correcting a typo, a "0" was dropped (read 0.8 instead of 0.08).

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NEW SECTION

WAC 51-11C-40627 Section C406.2—Other measures.

C406.2.14 Enhanced commercial kitchen equipment. For buildings or areas designated as Group A-2, or facilities whose primary business type involves the use of a commercial kitchen with at least one gas or electric fryer, all fryers, dishwashers, steam cookers and ovens shall comply with all of the following:

1. Achieve the ENERGY STAR label in accordance with the specifications current as of January 1, 2022.

2. Be installed prior to the issuance of the certificate of occupancy.

3. Have the ENERGY STAR qualified model number listed on the construction documents submitted for permitting.

Energy efficiency credits for efficient commercial kitchen equipment shall be determined based on Equation 4-19, rounded to the nearest whole number.

(Equation 4-19)

$$\text{AEEC}_K = 20 \times \frac{\text{Area}_K}{\text{Area}_B}$$

Where:

AEEC_K	=	Section C406.2.14 table credits, to a maximum of those allowed in Table C406.2 for this option.
Area_K	=	Floor area of full-service kitchen (ft^2 or m^2).
Area_B	=	Gross floor area of building (ft^2 or m^2).

C406.2.15 Residential kitchen equipment. For projects with Group R-1 and R-2 occupancies, energy credits shall be achieved where all dishwashers, refrigerators and freezers comply with all of the following:

1. Achieve the ENERGY STAR Most Efficient 2021 label in accordance with the specifications current as of:
   1.1. Refrigerators and freezers: 5.0, 9/15/2014.
   1.2. Dishwashers: 6.0, 1/29/2016.
2. Be installed prior to the issuance of the certificate of occupancy.

For Group R-1 where only some guestrooms are equipped with both refrigerators and dishwashers, the table credits shall be prorated as follows:

[Section C406.2.15 table credits] x [Floor area of guestrooms with kitchens] / [Total guestroom floor area]

Exception: Kitchen appliances in designated ADA dwelling units or guest rooms may be excluded from the requirements of this credit.

C406.2.16 Residential laundry appliances. For projects with Group R-2 occupancies, energy credits shall be achieved where all clothes washers and dryers in the project meet the following requirements:

1. Each dwelling unit contains in-unit washing washer and dryer equipment that meets the following requirements:
   1.1. Achieve the ENERGY STAR Most Efficient label in accordance with the 2021 specifications.
   1.2. Be installed prior to the issuance of the certificate of occupancy.
2. Where only some dwelling units are equipped with both washers and dryers, the table credits shall be prorated as follows:

[Section C406.2.16 table credits] x [Floor area of dwelling units with laundry] / [Total dwelling unit floor area]

Exception: Laundry appliances in designated ADA dwelling units or guest rooms may be excluded from the requirements of this credit.

Commented [NM38]: Editorial: ENERGY STAR

Commented [NM39]: ADA requirements will trump energy code, and it can be difficult to find appliances that meet both ADA accessibility standards AND Energy Star standards, let alone fall in the "most efficient" category. Since this only impacts a few units within each project, don't preclude credit achievement.

Commented [NM40]: ADA requirements will trump energy code, and it can be difficult to find appliances that meet both ADA accessibility standards AND Energy Star standards, let alone fall in the "most efficient" category. Since this only impacts a few units within each project, don't preclude credit achievement.

C406.2.17 Heat pump clothes dryers. All domestic clothes dryers located in Group R-1 and R-2 of the whole project are ENERGY STAR rated heat pump dryers. Credit applies only to buildings where heat pump dryers are within each residential dwelling or sleeping units or grouped together in central multi-family use laundry rooms.

To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall show the appliance type and provide documentation of ENERGY STAR compliance. At the time of inspection, all appliances shall be installed and connected to utilities.

Exception: Laundry appliances in designated ADA dwelling units or guest rooms may be excluded from the requirements of this credit.

C406.2.18 Efficient elevator equipment. Qualifying elevators in the building shall be Energy Efficient Class A in accordance with ISO 25745-2, Table 7. Only buildings three or more floors above grade shall be permitted to use this credit. Credits shall be prorated based on Equation 4-18, rounded to the nearest whole credit. Projects with a compliance ratio below 0.5 do not qualify for this credit.

(Equation 4-18)

$$EC_e = EC_t \times CR_e$$

Where:

EC_e = Elevator energy credit achieved for building.

EC_t = Section C406.2.18 table energy credit.

$CR_e = \frac{F_A}{F_B}$

F_A = Sum of floors served by Class A elevators.

F_B = Sum of floors served by all building elevators and escalators.

NEW SECTION

WAC 51-11C-40630 Section C406.3—Load management credits.

C406.3 Load management credits. Load management measures installed in the building that meet the requirements in Sections C406.3.1 through C406.3.7 shall achieve the credits listed for the occupancy group in Table C406.3 or where calculations required by Sections C406.3.1 through C406.3.7 create or modify the table credits the credits achieved will be based upon the section calculations.

Each load management measure required automatic controls activated by either utility demand response, utility price response signal, peak price period time control, or local building demand monitoring to be capable of performing the described load management practices. Controls shall be capable of and configured to provide the required load management sequences. The following additional control systems apply to these measures:

1. Where credit is taken for C406.3.6, service water heating energy storage, the equipment shall be provided with controls that com-

Commented [NM41]: ADA requirements will trump energy code, and it can be difficult to find appliances that meet both ADA accessibility standards AND Energy Star standards, let alone fall in the "most efficient" category. Since this only impacts a few units within each project, don't preclude credit achievement.

Commented [NM42]: Couldn't the formula just be: ECe = ECT x (FA /FB)

Why add in the CRe variable that itself is a simple calculation?

ply with ANSI/CTA 2045-B.

2. For other load management measures:

2.1. Where the serving utility has a real-time demand response or pricing program, an interface compliant with serving utility requirements shall be installed.

2.2. Where the serving utility does not have a real-time demand response or pricing program, a digital input to the system to support future utility programs shall be installed and building demand moni-

toring shall be installed and integrated into the load management sequence.

2.3. All equipment involved in the required load management sequence shall have controls connected to a central DDC system.

Table C406.3
Load Management Measure Credits

Measure Title	Applicable Section	Occupancy Group					
		Group R-1	Group R-2	Group B	Group E	Group M	All Other
1. Lighting load management	C406.3.1	12	15	27	15	NA	NA
2. HVAC load management	C406.3.2	29	24	42	23	13	26
3. Automated shading	C406.3.3	NA	7	12	16	NA	NA
4. Electric energy storage	C406.3.4	41	50	126	72	37	65
5. Cooling energy storage	C406.3.5	13	10	14	19	NA	14
6. Service hot water energy storage	C406.3.6	31	248	59	8	5	70
7. Building thermal mass	C406.3.7	NA	NA	50	95	96	80

C406.3.1 Lighting load management. Automatic controls shall be capable of gradually reducing general lighting power with continuous dimming in 75 percent of the building area by at least 20 percent during peak demand periods. Where less than 75 percent, but at least 50 percent, of the building area lighting is controlled, the credits from Table C406.3 shall be prorated as follows:

$$\frac{[\textit{Area of building with lighting load management}, \%] \times [\textit{Table credits for } \text{C406.3.1}]}{75\%}$$

EXCEPTION: Warehouse or retail storage building areas shall be permitted to achieve this credit by switching off at least 25 percent of lighting power in 75 percent of the building area without dimming.

C406.3.2 HVAC load management. Automatic controls shall:

1. Where electric cooling is used, be configured to gradually increase, over a minimum of three hours, the cooling setpoint by at least 3°F over the course of the coincident summer peak building load and peak price or demand periods.

2. Where electric heating is used, be configured to gradually reduce, over a minimum of three hours, the heating setpoint by at least 3°F during winter peak pricing or building peak demand periods.

C406.3.3 Automated shading load management. Where fenestration on south and west exposures exceeds 20 percent of the wall area, automatic controls shall be configured to operate movable exterior shading devices or dynamic glazing to reduce solar gain through sunlit fenestration on southern and western exposures by at least 50 percent during electrical summer peak periods.

Informative Note: This credit can be met by exterior roller, movable blind or movable shutter shading devices; however, fixed overhang, screen or shutter shading will not meet the requirement. Roller shades that reject solar gain but still allow a view are allowed as long as they provide an effective 50 percent reduction in net solar gain (e.g., have a shading coefficient of less than 0.5 for the shading material itself). Interior shading devices will not meet the requirement. Electrochromatic windows that achieve 50 percent of SHGC would qualify.

C406.3.4 Electric energy storage. Automatic controls shall store electricity in electric storage devices during nonpeak periods and use stored energy during peak periods to reduce building demand. Electric storage devices shall have a minimum capacity of 5 Wh/ft^2 (58 Wh/m^2) of gross building area. For greater storage capacity up to 15 Wh/ft^2 (160 Wh/m^2), credits shall be prorated as follows:

Commented [NM43]: Denominator of the formula included both 5 Wh/Square Foot and 58 Wh/Square Meter. Since numerator only includes the units in Wh/SF, the metric value should not be included in the denominator.

Additionally, I'm not able to format the formula as desired with edits, but the "x[406.34.4 credits from table C406.3]" should be pulled out of the denominator, and should be multiplied by the whole fraction (or inserted in the numerator, same mathematical result). Intent is that you'd calculate the ratio of installed storage to the minimum 5 Wh/SF, and multiple that ratio (which is >1) by the points available in the table for the 5 Wh/SF sized system.

$$\frac{\text{[Installed electric storage capacity, Wh/ft}^2\text{]} \times \text{[C406.3.4 credits from Table C406.3]}}{5 \text{ ~~(58)×[C406.3.4 credits from Table C406.3]~~}}$$

C406.3.5 Cooling energy storage. Automatic controls shall be capable of activating ice or chilled water storage to reduce electric demand during the hours of summer peak electric prices. Credits shown in Table C406.3 are based on storage capacity of 2 ton-hours per design day ton of colling load with a 1.15 sizing factor. Credits shall be prorated for installed storage systems sized between 0.5 and 3.5 ton-hours per design day ton of cooling load rounded to the nearest whole credit. The storage tank shall have no more than 1.5 percent of storage capacity standby loss per day.

C406.3.6 Service hot water energy storage. To achieve this credit, where service hot water is heated by electricity, automatic controls activated by utility demand response signal, peak price period time control, or local building demand monitoring shall preheat stored service hot water before the peak price period and suspend electric water heating during the period of peak prices coincident with peak building load. Storage capacity shall be provided by either:

1. Preheating water above 140°F (60°C) delivery temperature with at least 1.34 kWh of energy storage per kW of water heating capacity. Tempering valves shall be provided at the water heater delivery location.
2. Providing additional heated water tank storage capacity above peak service hot water demand with equivalent peak storage capacity to item 1.

C406.3.7 Building thermal mass. To achieve this credit, the building shall have both additional passive interior mass and a night-flush control of the HVAC system.

1. Interior to the *building thermal envelope* insulation, provide 15 pounds of passive thermal mass per square foot of building floor area. Mass construction shall be in the building interior and the indoor facing portion of the exterior wall, and interior floor construction. Mass construction shall have mass surfaces in direct contact with the air in conditioned spaces with directly attached wall board or hard surface flooring allowed. Mass with carpet or furred wallboard shall not be counted toward the building mass required. For integral insulated concrete block walls complying with ASTM C90, only the mass of the interior face shall be counted toward the building mass required.
2. When summer mode is active and indoor average temperature is 5°F (3°C) or more above outdoor temperature and between 10:00 p.m. and 6:00 a.m., *automatic* night flush controls shall operate outdoor air economizers at low fan speed less than 66 percent during the unoccupied period until the average indoor air temperature falls to the occupied heating setpoint. Summer mode shall be activated when outdoor air exceeds 70°F (21°C) and continues until deactivated when outdoor air falls below 45°F (7°C). Another night flush strategy shall be permitted where demonstrated to be effective, avoids added morning heating and is *approved* by the *code official*.

Informative Note: The simplified night flush sequence described will operate in "summer mode" below the 70°F outdoor air trigger temperature down until outdoor air of 45°F is hit when the "summer mode" is deactivated until the outdoor air temperature rises above 70°F again. Other strategies may be implemented that cool the space below the heating setpoint and adjust the morning heating setpoint to avoid morning reheating.

Commented [NM44]: Other similar credits with prorated point options include formula for calculating the partial or extrapolated credits (seeC406.3.4 for example).

AMENDATORY SECTION (Amending WSR 20-21-080, filed 10/19/20, effective 2/1/21)

WAC 51-11C-40702 Section C407.2—Mandatory requirements.

C407.2 Mandatory requirements. Compliance with ((~~this~~)) Section C407 also requires compliance with those sections shown in Table C407.2.

The building permit application for projects utilizing this method shall include in one submittal all building and mechanical drawings and all information necessary to verify that the building envelope and mechanical design for the project corresponds with the annual energy analysis. If credit is proposed to be taken for lighting energy savings, then an electrical permit application shall also be submitted and approved prior to the issuance of the building permit. If credit is proposed to be taken for energy savings from other components, then the corresponding permit application (e.g., plumbing, boiler, etc.) shall also be submitted and approved prior to the building permit application. Otherwise, components of the project that would not be approved as part of a building permit application shall be modeled ((~~the same in both the proposed building and the *standard reference design* and shall comply with the requirements of this~~)) in the baseline in accordance with ANSI/ASHRAE/IESNA 90.1 Appendix G and in the proposed model in accordance with the requirements of the Washington State Energy Code.

Table C407.2
Mandatory Compliance Measures for Total Building Performance Method

Section[a]	Title	Comments
Envelope		
C401	Thermal envelope certificate	
C402.2.7	Airspaces	
C402.5	Air leakage	
Mechanical		
C403.1.2	Calculation of heating and cooling loads	
C403.1.3	Data centers	
C403.2	System design	
C403.3.1	Equipment and system sizing	
C403.3.2	HVAC equipment performance requirements	
C403.3.3	Hot gas bypass limitation	
C403.3.4.4	Boiler turndown	
C403.3.6	Ventilation for Group R occupancy	
((~~C403.4~~	~~HVAC system controls~~))	
C403.4.1	Thermostatic controls	((~~Except for C403.4.1.4~~))

Commented [AB45]: Editorial Comment: Boiler turndown section renumbered

Section[a]	Title	Comments
C403.4.2	Off-hour controls	((~~Except for Group R~~))
C403.4.7	Combustion heating equipment controls	
C403.4.8	Group R-1 hotel/ motel guestrooms	See Section C403.7.4
C403.4.9	Group R-2 and R-3 dwelling units	
C403.4.10	Group R-2 sleeping units	
C403.4.11	Direct digital control systems	
C403.5.5	Economizer fault detection and diagnostics (FDD)	
C403.7	Ventilation and exhaust systems	Except for C403.7.6
C403.8	Fan and fan controls	
C403.9.1.1	Variable flow controls	For cooling tower fans ≥ 7.5 hp
C403.9.1.2	Limitation on centrifugal fan cooling towers	For open cooling towers
C403.10	Construction of HVAC elements	
C403.11	Mechanical systems located outside of the building thermal envelope	
C403.13	Commissioning	
Service Water Heating		
C404	Service water heating	
Lighting and Electrical		
((~~C405.1~~	~~General~~	
~~C405.2~~	~~Lighting controls~~	
~~C405.3~~	~~Exit signs~~	
~~C405.4~~	~~Interior lighting power~~	
~~C405.5~~	~~Exterior building lighting power~~	
~~C405.6~~	~~Electrical transformers~~	
~~C405.7~~	~~Dwelling unit energy consumption~~	
~~C405.8~~	~~Electric motor efficiency~~	
~~C405.9~~	~~Vertical and horizontal transportation~~	
~~C405.10~~	~~Controlled receptacles~~	
~~C405.11~~	~~Voltage drop in feeders~~))	

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Section[a]	Title	Comments
C405	Electrical power and lighting systems	
Other Requirements		
C407	Total building performance	
C408	System commissioning	
C409	Energy metering	
C410	Refrigeration requirements	
C411	~~Solar readiness~~Renewable Energy	

[a] Reference to a code section includes all the relative subsections except as indicated in the table.

AMENDATORY SECTION (Amending WSR 19-24-040, filed 11/26/19, effective 7/1/20)

WAC 51-11C-40703 Section C407.3—Performance-based compliance.

C407.3 Performance-based compliance. Compliance with this section requires compliance with ASHRAE Standard 90.1 Appendix G, Performance Rating Method, in accordance with Standard 90.1 Section 4.2.1 with the following modifications:

1. The mandatory requirements of the Washington State Energy Code are required to be met, instead of those of Section G1.2.1a of ((~~Standard~~)) ANSI/ASHRAE/IESNA 90.1 ((~~are not required to be met~~)).

2. ((~~The reduction in annual carbon emissions of the proposed building design associated with on-site renewable energy shall not be more than 3 percent of the total carbon emissions of the baseline building design.~~

3. ~~References to energy cost in Section 4.2.1.1 and Appendix G shall be replaced by carbon emissions calculated by multiplying site energy consumption by the carbon emission factor from Table C407.3(1).~~

4. ~~The building performance factors in Table C4.2.1.1 shall be replaced with those in Table C407.3(2).~~)) Compliance with Section C407 requires meeting both an emissions and site energy reduction target in accordance with the following:

2.1. Carbon emissions target. The carbon emissions target is focused on regulated load energy efficiency, thus shall be met only via regulated load savings without consideration of the contribution of on-site or off-site renewable energy or unregulated load savings. Adjustments to the PCI, to account for the contribution of renewable energy found in ANSI/ASHRAE/IESNA 90.1 Section 4.2.1.1 shall not be used. References to energy cost in Section 4.2.1.1 and Appendix G shall be replaced by carbon emissions calculated by multiplying site energy consumption by the carbon emission factor from Table C407.3(1). The building performance factors in Table 4.2.1.1 of ANSI/ASHRAE/IESNA 90.1 shall be replaced with those in Table C407.3(2).

2.2. Site energy target. The site energy performance target shall be met including the contributions of on-site or off-site renewable energy as described in Section C411.3 as well as the contributions of improvements in unregulated loads as allowed by Section C407.3.2. Com-

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Commented [IR49]: Recommend allowing renewable energy to count towards PCI targets. At minimum renewable energy in excess of C411.1 requirements should be included

Commented [AB50R49]: Or verify that final/revised BPF targets with adjusted electricity carbon factor do NOT account for any renewable energy in the targets.

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Commented [IR51]: Recommend a formal definition of "site energy performance" or "site energy use"

Commented [IR52]: C411.3 is Solar Readiness - should this be C411.1?

Commented [IR53]: C407.3.2 refers to on/off site renewable energy - should be C407.3.4

pliance with the site energy performance target requires that the proposed building site energy use/baseline building site energy use is less than or equal to the site energy performance target from Table C407.3(~~2~~3).

3. Documentation requirements in Section G1.3.2.d shall be replaced by a list showing compliance with the mandatory provisions of Table C407.2.

4. Forms demonstrating compliance with Appendix G developed by the U.S. Department of Energy shall be completed and submitted to the *code official*. The forms are available at energycodes.gov/ashrae-standard-901-performance-based-compliance-form.

5. References to yet-to-be-designed future building components in the Proposed Building Performance column of Table G3.1 shall be modified to reference the corresponding sections of the Washington State Energy Code in lieu of the requirements of ANSI/ASHRAE/IESNA 90.1 in the following sections of the table:

5.1. No. 1, Design Model, subclause c.

5.2. No. 6, Lighting, subclause c.

5.3. No. 11, Service Water Heating System, subclause c.

5.4. No. 12, Receptacle and Other Loads, subclause b.

6. HVAC systems, subclauses c and d of Table G3.1, shall meet the following requirements:

6.1. For yet-to-be-designed systems in office, retail, library, education, and multifamily buildings and occupancies subject to the TSPR requirements of Section C403.1.1, the system type and efficiency parameters in the proposed model shall meet but not exceed those shown in Table D602.11 Standard Reference Design HVAC Systems.

6.2. For all other buildings and occupancies, the system type shall be the same as the system modeled in the baseline design and shall comply with but not exceed the requirements of Section C403 in lieu of ANSI/ASHRAE/IESNA 90.1.

6.3. For HVAC systems serving future tenant spaces, where the current building permit applies to only a portion of an HVAC system, and future components will receive HVAC services from systems included in the current building permit, those future components shall be modeled as the type required to complete the HVAC system portions under the current permit and shall meet but not exceed the requirements found in Section C403.

7. The requirements for proposed and baseline building lighting system shall be modified in accordance with Addendum af to ANSI/ASHRAE/IESNA 90.1.

8. Energy modeler qualifications. The energy analyst in responsible charge of the Section C407 submittal shall meet at least one of the following:

8.1. ASHRAE Building Energy Modeling Professional (BEMP) certification.

8.2. Association of Energy Engineer's Building Energy Simulation Analyst (BESA) certification.

8.3. Successful completion of at least five projects modeled following any version of ANSI/ASHRAE/IESNA 90.1 Appendix G within the last three years that were reviewed and approved by a *code official* or rating authority.

C407.3.1 Limits on nonmandatory measures. The Proposed Total UA of the proposed building shall be no more than 20 percent higher than the Allowed Total UA as defined in Section C402.1.5.

Commented [AB54]: Editorial comment: Update table reference

Commented [IR55]: Editorial: Addition for clarity

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C407.3.2 On-site and off-site renewable energy accounting for use with Appendix G. Qualifying on-site and off-site renewable energy delivered or credited to the building project to comply with Section C407.3 item 2.2 shall meet the requirements of Section C411.2.

C407.3.3 Low-carbon district energy use with Appendix G. Qualifying *low-carbon district heating and cooling or heating only systems* and *low-carbon district energy exchange systems* shall meet the requirements of Section C407.3.3.1 or C407.3.3.2, as applicable.

C407.3.3.1 Utilization of low-carbon district heating and cooling or heating only systems. Applicable if heating and cooling or heating only is provided to the *proposed building* from a *low-carbon district heating and cooling or heating only system* that is fully operational prior to the final inspection. Proposed model shall account for all on-site HVAC and service hot water related equipment, such as circulation pump energy and heat-exchanger efficiency.

1. The following modifications shall be applied to Appendix G of ANSI/ASHRAE/IESNA 90.1 in addition to what is described in Section C407.3:

1.1. For low-carbon district heating and cooling systems, strike the text of Sections G3.1.1.1, G3.1.1.2, G3.1.1.3.1, and G3.1.1.3.4. Baseline system shall be selected based on unmodified versions of Tables G3.1.1-3 and G3.1.1-4, with carbon emission factors from Table C407.3(1).

1.2. For low-carbon district heating only systems, strike the text of Sections G3.1.1.1, G3.1.1.3.1, and G3.1.1.3.4. Baseline system shall be selected based on unmodified versions of Tables G3.1.1-3 and G3.1.1-4, with carbon emission factors from Table C407.3(1).

2. Any heating or cooling energy provided by the *low-carbon district heating and cooling or heating only system* shall utilize footnote a of Table C407.3(1) for the district system carbon emission factor in the proposed model to account for carbon emissions from those end uses.

3. ~~Waste energy exported from the building to the low-carbon district heating and cooling or heating only system shall not be considered purchased energy.~~ Carbon ~~emissions~~ emission "credit" ~~from~~ for ~~the~~ any waste/recoverable heat ~~—~~exported to the *low-carbon district heating and cooling or heating only systems* —shall be accounted for in the proposed design by multiplying the quantity of heat exported by the ~~carbon emissions at the seasonal factors below. The exported energy emissions credit shall be calculated based on~~ Carbon Emission Factor established in footnote a of Table C407.3(1) multiplied by the appropriate seasonal utilization factor in 3.1 and 3.2 below. This carbon emission "credit" is subtracted from the total proposed design carbon emissions calculated per ASHRAE 90.1 Section 4.2.1.1. ~~):~~

3.1. Fifty percent of the waste heat exported to the *low-carbon district heating and cooling or heating only systems* during the months of October through December and January through March ~~shall be subtracted from the proposed design carbon emissions~~.

3.2. Twenty-five percent of the waste heat exported to the *low-carbon district heating and cooling or heating only systems* during the months of April through September ~~shall be subtracted from the proposed design carbon emissions~~.

EXCEPTION: Waste heat exported from the building to the *low-carbon district heating and cooling or heating only system* shall not be subtracted from the proposed design carbon emissions if they are already accounted for in the calculation of emissions from the district heating or cooling plant.

Documentation for the low-carbon district system that is operational prior to the final inspection shall be provided to demonstrate

Commented [AB57]: Editorial comments to clarify intention of credits for heat rejection back to the district energy plant.

Commented [AB58]: Recommend adding defined equations to clarify this calculation

the following:

1. Distribution losses must be accounted for and may not exceed 10 percent of the annual load delivered to buildings served by the system.

2. Twenty-five percent of the annual district-system-net-load-met (sum of heating and cooling energy provided to attached buildings) comes from heat recovery between connected buildings, waste heat orrenewable energy resources and no more than 25 percent of the annual heat input to the system comes from fossil fuel or electric-resistance sources, or not more than 10 percent of the system annual heat input to the system comes from fossil fuel or electric-resistance sources.

C407.3.3.2 Utilization of low-carbon district energy exchange systems. Applicable if heating or cooling is provided to the *proposed building* from a *low-carbon district energy exchange system* that is fully operational prior to the final inspection. Proposed model shall account for all on-site HVAC and service hot water related equipment, such as circulation pump energy and heat-exchanger efficiency.

1. The following modifications shall be applied to Appendix G of ANSI/ASHRAE/IESNA 90.1 in addition to what is described in Section C407.3:

1.1. Strike the text of Sections G3.1.1.1, G3.1.1.2, G3.1.1.3, G3.1.1.3.1, G3.1.1.3.2, G3.1.1.3.3, and G3.1.1.3.4. Baseline system shall be selected based on unmodified versions of Tables G3.1.1-3 and G3.1.1-4, with carbon emission factors from Table C407.3(1).

2. Any heating or cooling energy provided by a *low-carbon district energy exchange system* shall utilize footnote a of Table C407.3(1) for the district system carbon emission factor in the proposed model.

3. Carbon emission "credit" for any waste/recoverable heat exported to the *low-carbon district energy exchange system* shall be accounted for in the proposed design by multiplying the quantity of heat exported by the Carbon Emission Factor established in footnote a of Table C407.3(1) multiplied by the appropriate seasonal utilization factor in 3.1 and 3.2 below. This carbon emission "credit" is subtracted from the total proposed design carbon emissions calculated per ASHRAE 90.1 Section 4.2.1.1. ~~Waste energy exported from the building to the *low-carbon district energy exchange system* shall not be considered purchased energy and shall be accounted for in the proposed design carbon emissions based on footnote a of Table C407.3(1) at the factors below:~~

3.1. Fifty percent of the waste heat exported to the *low-carbon district energy exchange system* during the months of October through December and January through March~~ shall be subtracted from the proposed design carbon emissions~~.

3.2. Twenty-five percent of the waste heat exported to the *low-carbon district energy exchange system* during the months of April through September~~ shall be subtracted from the proposed design carbon emissions~~.

EXCEPTION: Waste heat exported from the building to the *low-carbon district heating and cooling or heating only system* shall not be subtracted from the proposed design carbon emissions if they are already accounted for in the calculation of emissions from the district heating or cooling plant.

Documentation for the low-carbon district system that is operational prior to the final inspection shall be provided to demonstrate that the definition of *low-carbon district energy exchange system* is satisfied

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Commented [AB60]: Recommend adding defined equations to clarify this calculation

NEW SECTION

Table C407.3(3)
Site Energy Performance Targets to be used for Compliance with Section C407.3

Building Area Type	~~Building~~ Energy Performance Factor
Multifamily	0.58
Health care/hospital	0.57
Hotel/motel	0.62
Office	0.56
Restaurant	0.70
Retail	0.45
School	0.44
Warehouse	0.49
All others	0.55

Commented [AB61]: Editorial comment

AMENDATORY SECTION (Amending WSR 19-24-040, filed 11/26/19, effective 7/1/20)

WAC 51-11C-41100 Section C411—((~~Solar readiness.~~)) Renewable energy.

C411.1 ((~~General.~~)) On-site renewable energy. Each new building, or addition larger than 10,000 square feet of gross *conditioned floor area*, shall include a renewable energy generation system consisting of not less than 0.5 W/ft^2 or 1.7 Btu/ft^2 multiplied by the sum of the gross *conditioned floor area*.

EXCEPTIONS:
1. Any building where more than 50 percent of the roof area is shaded from direct beam sunlight by natural objects or by structures that are not part of the building for more than 2500 annual hours between 8:00 a.m. and 4:00 p.m.
2. Any building where more than 80 percent of the roof area is covered by any combination of equipment other than for on-site renewable energy systems, planters, vegetated space, skylights or occupied roof deck.
3. Alterations that do not include additions.

C411.1.1 Additional efficiency credits.

C411.1.1.1 On-site renewable energy reduced, prescriptive. Buildings which qualify for one of the exceptions in Section C411.1 to omit installation of on-site renewable energy must achieve an additional 18 efficiency package credits from Table C406.2.

C411.1.1.2 On-site renewable energy reduced, total building performance. Buildings which qualify for one of the exceptions in Section C411.1 to omit installation of on-site renewable energy must achieve a building performance factor (BPF) no less than **XX** percent lower than the maximum BPF permitted cumulatively by all other sections of this code.

C411.1.1.~~2~~3 On-site renewable energy capacity increased. Buildings which install PV systems which exceed the capacity requirements of Section C411.1 may achieve additional efficiency package credits as described in Section C406.2.5.

C411.1.1.~~3~~4 Partial capacity. On-site renewable energy installations of lower than required capacity can be counted proportionally toward ach- ievement of required or additional efficiency credits in Section C411.1.1 based on the capacity of renewable energy installed compared to the requirements of Section C411.1.

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Commented [AB62]: Is the intent to require an "offset" for use of the roof coverage/shading exception similar to the additional C406 credits? If so, consider allowing the 3% on-site renewable credit for the building performance factor per C407.3 item 2.1

C411.3 Solar readiness. A solar zone shall be provided on nonresidential buildings (buildings with more than 50% of the conditioned floor area that is other than Group R occupancies) that are 20 stories or less in height above grade plan. The solar zone shall be located on the roof of the building or on an- other structure elsewhere on the site. The solar zone shall be in ac- cordance with Sections C411.2 through C411.8 and the *International Fire Code*.

EXCEPTION: A solar zone is not required ((~~where the solar exposure of the building's roof area is less than 75 percent of that of an unshaded area, as defined in Section C411.5, in the same location, as measured by one of~~)) under the following conditions:
1. Where the solar exposure of the building's roof area is less than 75 percent of that of an unshaded area, as defined in Section C411.5, in the same location, as measured by one of the following:
1.1. Incident solar radiation expressed in kWh/ft^2-yr using typical meteorological year (TMY) data.
((~~2.~~)) 1.2. Annual sunlight exposure expressed in cumulative hours per year using TMY data.
((~~3.~~)) 1.3. Shadow studies indicating that the roof area is more than 25 percent in shadow, on September 21st at 10 a.m., 11 a.m., 12 p.m., 1 p.m., and 2 p.m. solar time.
2. Buildings, building additions, changes in space conditioning or occupancy where the total floor area is equal to or less than 500 square feet.

((~~C411.2~~)) C411.3.1 Minimum area. The minimum area of the solar zone shall be determined by one of the following methods, whichever results in the smaller area:

1. 40 percent of roof area. The roof area shall be calculated as the horizontally projected gross roof area less the area covered by skylights, occupied roof decks, mechanical equipment, mechanical equipment service clearances and planted areas.

2. 20 percent of electrical service size. The electrical service size is the rated capacity of the total of all electrical services to the building, and the required solar zone size shall be based upon 10 peak watts of photovoltaic per square foot.

EXCEPTION: Subject to the approval of the code official, buildings with extensive rooftop equipment that would make full compliance with this section impractical shall be permitted to reduce the size of the solar zone required by Section C411.2~~3~~ to the maximum practicable area.

Commented [EVM63]: Recommending editorial addition to clarify what a nonresidential building is as this is not a defined term or clarify if this is meant to refer to commercial buildings by removing the word "nonresidential".

Commented [EVM64]: Recommend clarifying that the mechanical equipment service clearances are not included in the minimum area calculation.

Commented [AB65]: Editorial correction to correct to Section reference to C411.3.

OPTION 2 for Section C503.4 ~~thourgh~~ through C503.4.6.1

C503.4 Building mechanical systems. ((~~Those parts of~~)) Components of existing mechanical systems ((~~which~~)) that are altered or replaced shall comply with Section C403, unless specifically exempted in this section, and Sections C408.2, C409.5, C501.2.2, C501.6, and C503.4.2 through C503.4.5. Additions or alterations shall not be made to an existing mechanical system that will cause the existing ((~~mechanical~~)) system to become out of compliance.

EXCEPTIONS:

1. Existing mechanical systems ((~~which are altered or parts of the systems are replaced are not required to be modified to comply with Section C403.3.5 as long as~~)) are not required to be modified to comply with Section C403.3.5 where mechanical cooling capacity is not added to a system that did not have cooling capacity prior to the alteration.
2. Compliance with Section C403.1.4 is not required where the alteration does not include replacement of a heating appliance.
3. Alternate mechanical system designs that are not in full compliance with this code may be approved when the code official determines that existing building constraints including, but not limited to, available mechanical space, limitations of the existing structure, or proximity to adjacent air intakes or exhausts makes full compliance impractical. Alternate designs shall include additional energy saving strategies not prescriptively required by this code for the scope of the project including, but not limited to, demand control ventilation, energy recovery, or increased mechanical cooling or heating equipment efficiency above that required by Tables C403.3.2(1) through C403.3.2((~~(12)~~)) (16).
((~~3.~~)) 4. Only those components of existing HVAC systems that are altered or replaced shall be required to ((~~meet the requirements of~~)) comply with Section C403.8.1((~~, Allowable fan motor horsepower. Components replaced or altered shall not exceed the fan power limitation pressure drop adjustment values in Table C403.8.1(2) at design conditions~~)). Section C403.8.1 does not require the removal and replacement of existing system ductwork. Additional fan power allowances are available when determining the fan power budget (Fan kW_{budget}) as specified in Table C503.4. These values can be added to the fan power allowance values in Tables C403.8.1.1(1) and C403.8.1.1(2) when calculating a new Fan kW_{budget} for the fan system being altered. The additional fan power allowance is not applicable to alterations that add or change passive components which do not increase the fan system static pressure.

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